2005 – 2007 Implementation Plan

for the

Federal Columbia River Power System

Endangered Species Act

Updated Proposed Action

U.S. Army Corps of Engineers
Bureau of Reclamation
Bonneville Power Administration

May 2005

2005 – 2007 Implementation Plan

Table of Contents

List of Figures and Tables

I. Introduction

The Federal Columbia River Power System (FCRPS), a system of dams and reservoirs located in the Columbia River Basin, is operated and maintained by the Corps of Engineers (Corps) and Bureau of Reclamation (Reclamation). The FCRPS projects were authorized by Congress for multiple purposes, including flood control, irrigation, fish and wildlife, power generation, navigation, water quality, municipal and industrial water, and recreation. Bonneville Power Administration (BPA) is responsible for marketing and transmission of power generated from these projects. Collectively, the Corps, Reclamation, and BPA are referred to as the Action Agencies.

The Action Agencies have prepared this implementation plan to describe actions they intend to implement to avoid jeopardy to Columbia Basin salmonids listed or proposed for listing under the Endangered Species Action (ESA) and adverse modification of designated critical habitat. This implementation plan (*2005-07 IP*) covers a three-year period, 2005-2007.

The *2005-07 IP* provides implementation details of the Action Agencies' *Final Updated Proposed Action for the FCRPS Biological Opinion Remand* (UPA). NOAA Fisheries' approved the UPA in it's *Revised 2004 Biological Opinion on the Operation of the Federal Columbia River Power System and 19 Bureau of Reclamation Projects* (2004 BiOp). The UPA describes the actions and performance goals that the Action Agencies commit to achieve over the duration of the 2004 BiOp (through 2014).

Under the UPA, the Action Agencies made specific commitments to actions going beyond those contained in the previous Biological Opinion for operation of the FCRPS (the 2000 BiOp) including accelerated installation of surface juvenile fish passage facilities such as spillway weirs and other improvements; expanded management of predatory fish and birds, habitat actions with specific locations and performance metrics, and new hatchery program initiatives. NOAA Fisheries concluded that these collective actions would avoid jeopardy to 13 evolutionarily significant units (ESUs) of Columbia Basin salmonids listed or proposed to be listed under the ESA and the destruction or adverse modification of designated critical habitat. In January 2005, each Action Agency documented its intent to implement the actions in the UPA and analyzed in the 2004 BiOp in decision documents posted on www.salmonrecovery.gov.

ESA-listed ESUs included in the 2004 BiOp

1. Snake River spring/summer Chinook salmon
2. Snake River fall Chinook salmon
3. Upper Columbia River spring Chinook salmon
4. Upper Willamette River Chinook salmon
5. Lower Columbia River Chinook Salmon
6. Snake River steelhead
7. Upper Columbia River steelhead
8. Mid-Columbia River steelhead
9. Upper Willamette River steelhead
10. Lower Columbia River steelhead
11. Columbia River chum salmon
12. Snake River sockeye
13. Lower Columbia River coho *(proposed)*

The UPA and the *2005-07 IP* are both based on an adaptive management framework of performance standards and measures, implementation strategies and planning, progress reporting and assessment at regular intervals, and a comprehensive research, monitoring, and evaluation (RM&E) program. As part of the adaptive management framework, the *2005-07 IP* provides the Action Agencies' work plan for achieving the 2007 performance goals outlined in the UPA.

The 2004 BiOp included (1) an ***Incidental Take Statement*** (ITS) with reasonable and prudent measures and terms and conditions to authorize the incidental take of listed fish associated with the implementation of those actions; and (2) ***Conservation Recommendations*** to avoid or minimize adverse effects from the

implementation of actions in the UPA. Implementation of the ITS and Conservation Recommendations are addressed in this *2005-07 IP*.

A. Public Review and Comment

The *2005-07 IP* provides project level detail for the actions that the Action Agencies are implementing to avoid jeopardy and improve survival of listed salmon and steelhead during the 2005-2007 time period. The *Draft 2005-07 IP* was posted on www.salmonrecovery.gov on March 2, 2005; comments received since then have been considered as this plan was finalized.

This *2005-07 IP* and subsequent implementation plans reflect a performance-based approach and over time the Action Agencies will adapt actions to best meet our performance standards and targets. Regional input on how best to achieve these performance targets is important. Implementation plans will be prepared for a 3-year period. The Action Agencies intend to hold regional discussions as results of progress are evaluated (through Progress Reports) and determine whether mid-course modifications need to be made to implementation actions in order to achieve our three-year performance targets. The Action Agencies will report annually on implementation progress as well as on a comprehensive basis at 3-year intervals. The Action Agencies will continually seek input and involvement from existing forums and processes throughout implementation of the UPA so that actions implemented to meet BiOp and UPA goals take into account regional interests to the greatest extent possible.

U.S. Fish and Wildlife Service (USFWS) Biological Opinion on Effects to Listed Species from Operations of the FCRPS

The USFWS issued a biological opinion in December 2000 for the operation and maintenance of the FCRPS (USFWS BiOp). The USFWS BiOp includes measures that the Action Agencies are to implement to ensure that FCRPS operations avoid jeopardy to ESA-listed bull trout and Kootenai River white sturgeon. In September 2002, the USFWS designated critical habitat for the Kootenai River white sturgeon.

In July 2004 the Corps and BPA submitted a supplemental biological assessment and began re-consulting with the USFWS (1) to address FCRPS operational effects to the Kootenai River white sturgeon designated critical habitat; and, (2) to respond to updated and new information.

The 2000 USFWS BiOp called for the Action Agencies to prepare annual 1- and 5-year implementation plans. The Action Agencies have asked the USFWS to consider the UPA implementation plans and progress reports as an acceptable alternative to the USFWS BiOp annual planning requirement.

This *2005-07 IP* does not include actions specific to USFWS BiOp implementation. However, assuming the USFWS agrees and once the reconsultation is complete, the Action Agencies will amend the *2005-07 IP* to include actions that will be implemented under the revised USFWS BiOp to benefit bull trout and Kootenai River white sturgeon.

II. Summary of Actions by ESU

The UPA included specific commitments for ESUs affected by FCRPS operations. Over the next 3 years the Action Agencies will implement the following types of actions to improve the survival of listed ESUs:

Hydrosystem actions: Hydrosystem actions are expected to benefit all listed ESUs. Dam passage improvements, water management, and fish transportation are expected to provide survival improvements and to inform future actions.

- The Corps will continue to configure dam facilities to improve juvenile and adult fish passage survival.
- The Corps and Reclamation will continue to operate projects to provide flows and spill operations to improve fish survival.

- The Corps will continue to operate and maintain fish passage facilities to improve reliability and fish survival.
- The Action Agencies will continue to implement an RM&E program that evaluates the effectiveness of configuration improvements and demonstrates the system improvements.

Predator control actions: Predator control actions are expected to provide survival improvements to all listed ESUs.

- The Corps and USFWS are finalizing the Environmental Impact Statement (EIS) for the *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary*. The Corps, BPA, and USFWS will initiate implementation of the selected alternative.
- The Corps and BPA are continuing and expanding research efforts to monitor and evaluate the effects of Caspian tern redistribution on juvenile salmon.
- The Corps and BPA will initiate studies to investigate the regional double-crested cormorant population and potential management measures to disperse that population.
- BPA is increasing the reward structure for the Northern Pikeminnow Management Program (NPMP) to achieve further reduction of pikeminnow predation on listed salmon and will also use an incentive-based approach to test site-specific removals of northern pikeminnow and other non-indigenous fish predators.
- The Corps is working with NOAA and the states to eevaluate the effects and identify methods to address marine mammal (pinniped) predation at and below Bonneville Dam.

Hatchery actions: In addition to the continuing conventional hatchery mitigation program, certain hatchery actions will reduce the risk of extinction to many ESUs and will provide survival benefits to Snake River fall Chinook and Snake River sockeye.

- BPA will continue to fund safety-net programs for the Snake River Sockeye, Snake River spring/summer Chinook, Mid-Columbia steelhead, Lower Columbia River steelhead, and Columbia River chum ESUs as long as NOAA Fisheries considers these programs to effectively contribute to reducing the risk of extinction.
- The Corps and BPA will improve the adult trap at Lower Granite Dam to benefit the Snake River fall Chinook ESU.
- BPA will enhance Snake River sockeye smolt production in conjunction with the current safety-net program to benefit the Snake River sockeye ESU.
- BPA will continue to fund the Safety Net Artificial Propagation Program (SNAPP) planning process and if necessary will develop safety-net contingency plans for populations identified as being at high risk of extinction.

Estuary habitat improvements: Estuary habitat improvements are expected to benefit all listed-ESUs, but are primarily focused on improving survival of Snake River fall Chinook.

- The Corps and BPA will protect, enhance, and restore shallow water and wetland habitats along and adjacent to the mainstem Columbia River below Bonneville Dam and tidal wetlands.

Tributary habitat improvements: Tributary habitat improvements are expected to improve habitat and the survival of Upper Columbia River, Snake River, and Mid-Columbia River ESUs.

- Reclamation and/or BPA will lease, purchase, and/or conserve 12 cubic feet per second (cfs) of streamflow; resolve 5 irrigation diversion screen problems; restore 60 miles of tributary access and 4 miles of stream complexity; and protect or enhance 6 miles of riparian habitat for the Upper Columbia River spring Chinook and steelhead ESUs in the Wenatchee, Entiat, and Methow subbasins.
- As *conservation measures* to improve tributary habitat:

  - BPA will improve fish habitat and implement riparian easements for Upper Columbia River steelhead in the Okanogan subbasin.
  - Reclamation will lease, purchase, and/or conserve 20 cfs of streamflow, provide technical assistance to resolve 10 irrigation diversion screen problems, and restore 54 miles of tributary access and 0.3 miles of complexity for the Snake River spring/summer Chinook and steelhead ESUs in the Lemhi Upper Salmon and Little Salmon subbasins.
- Reclamation will participate in projects to lease, purchase, and/or conserve 7 cfs of water and also will provide technical assistance to resolve 30 irrigation diversion screen problems; restore 24 miles of tributary access; and restore 3 miles of complexity for the Mid-Columbia River steelhead ESU in the Upper John Day, Middle Fork John Day, and North Fork John Day subbasins.

Research, monitoring and evaluation (RM&E): The Action Agencies are continuing to implement a comprehensive RM&E program.

- The Action Agencies will continue to monitor the status of ESA-listed fish populations.
- The effects of hydrosystem and non-hydrosystem actions on fish production, survival, fish condition and habitat condition will be assessed with a quantitatively rigorous approach.
- The Action Agencies will continue studies to resolve areas of uncertainty for the needed survival improvements of ESA-listed fish populations.
- Projects supporting the RM&E program are being implemented in the hydrosystem corridor and estuary and tributary habitat areas. Action effectiveness monitoring and evaluation of the predator control and safety-net hatchery programs are also being implemented and will continue as an important component of the Action Agencies' efforts.
- Regional coordination remains a critical aspect of the Action Agencies RM&E Program and participation with Pacific Northwest Aquatic Monitoring Program (PNAMP), Northwest Environmental Data-Network (NED), Lower Columbia River Estuary Partnership (LCREP), Independent Scientific Review Panel (ISRP), the Northwest Power and Conservation Council (Council), NOAA Fisheries' Regional Forum, Anadromous Fish Enhancement Program (AFEP), and other existing forums engaged in RM&E issues will continue.

III. General Approach

In the UPA, the Action Agencies prioritized actions for the ESUs most in need of survival improvements. Actions are categorized as hydrosystem, predator control, estuary habitat, tributary habitat and hatchery. This general prioritization and "stacking" of actions is conceptually displayed in Figure 1.

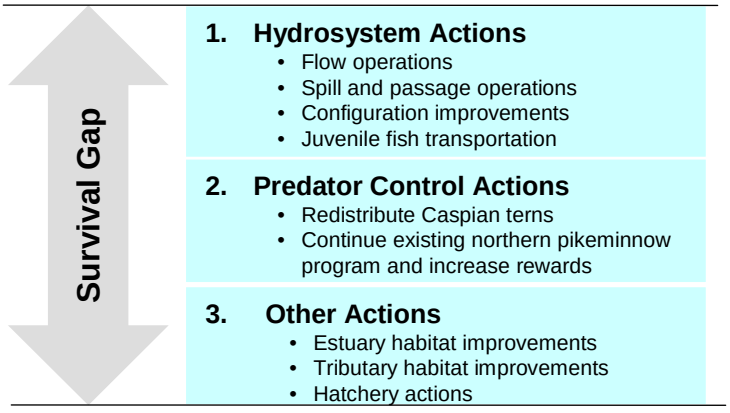

Figure 1 Action Agency general prioritization of actions to fill FCRPS survival gaps

A. Adaptive Management

Adaptive management is an iterative process whereby information and/or data obtained through monitoring and evaluation will be used in discussions with NOAA Fisheries to adjust and/or modify actions described in the UPA and to continue to avoid jeopardy to ESUs addressed in the 2004 BiOp. The Action Agencies use adaptive management to adjust the balance of competing needs and manage our priorities. The Action Agencies use the adaptive management process to adjust or modify the actions within the scope of the UPA, BiOp, and respective Records of Decision (RODs). Additional coordination, including potential reconsultation and additional National Environmental Policy Act (NEPA) coordination would be required for any decisions outside of the range addressed in existing decision documents.

Adaptive management results in adjustments to the UPA that are usually made based on new technical information and/or policy needs or in response to specific environmental conditions, research results, or opportunities. They may be made within a specific action category or across the various action categories. Adaptive management modifications may be made for a near- or short-term basis and they may result in temporary or more permanent changes. The Action Agencies plan to use an approach that includes consideration of the best available information and regional input. The RM&E program is focused on providing information needed to inform the adaptive management framework.

The Action Agencies describe below their approach to adaptive management for each action category. Adjustments to the UPA will be reflected in future implementation plans or amendments to implementation plans.

Hydrosystem

Hydrosystem adaptive management usually occur within the operating year in response to specific conditions in the river environment or at a dam and operational or configuration changes based on research results. Examples include adjusting flow augmentation or spill volumes in response to fish migration or water supply. These adjustments occur as in-season management, and are coordinated through the Regional Forum's Technical Management Team (TMT) and Implementation Team (IT). This process often considers trade-offs and priorities – for example, spring vs. summer flows.

Hydrosystem adaptive management also occurs with configuration changes at the dams, and in response to research results about the effectiveness of operations and configuration improvements. These types of changes will continue to be developed in the Regional Forum workgroups and advanced to the appropriate technical or policy team, including the System Configuration Team (SCT) and the Water Quality Team (WQT), for consideration. This process allows full consideration of technical and policy positions of the sovereigns before any final determinations are made by the responsible agencies.

The Action Agencies recognize that hydrosystem adaptive management may suggest significant changes in actions or policy that could necessitate a more formal analysis and review process, e.g., environmental review under NEPA or additional ESA consultation. Nevertheless, the Action Agencies will coordinate those analyses and processes through the Regional Forum, as appropriate.

Predator Control

Avian predator control adaptive management is being considered through the environmental review process. Following completion of the RODs for the final *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary EIS*, the Corps, in coordination with the USFWS, BPA, and others, will prepare an implementation plan for Caspian tern management actions.

The Action Agencies will continue to monitor predation by Caspian terns and double crested cormorants throughout the lower and mid-Columbia River and will consider appropriate managemenent options in coordination with NOAA Fisheries and the region.

Northern pikeminnow predator control adaptive management is handled through the NPMP work group, comprised of Oregon and Washington Departments of Fish and Wildlife, BPA, and the Pacific States Marine Fisheries Commission (PSMFC). Annual implementation activities are developed based on the NPMP annual research plan, which is heavily focused on monitoring. Typical annual activity development include identifying the harvest exploitation rate and appropriate reward structure for the upcoming year.

Marine mammal predation at and below Bonneville Dam has become a heightened concern since completion of the UPA and *Draft 2005-07 IP*. The Corps is working closely with NOAA Fisheries and the states to identify appropriate management options for those sea lions entering the fish ladder. The Action Agencies will continue to evaluate and work with NOAA Fisheries and others in the region on the issue of marine mammal predation on salmon and steelhead.

Estuary Habitat

Estuary habitat adaptive management will be based on information derived from the estuary RM&E program and other policy considerations, such as funding availability. The estuary RM&E program includes status monitoring research to improve the understanding of the use and importance of elements of the estuary and action effectiveness research to demonstrate the benefits of individual projects once they are completed. The results of this research will be used to determine whether expected benefits have been achieved by estuary restoration projects or additional estuary projects are required, and help to inform development of future projects. Development of any future projects in the estuary will be coordinated with NOAA Fisheries and other interested parties such as LCREP and the Council.

Tributary Habitat

Tributary habitat adaptive management is defined by 3- and 6-year *metric goals*[1]. The UPA tributary habitat metric goals were established to address those limiting factors identified by NOAA Fisheries that could legally and practically be addressed by the Action Agencies. Selection of individual projects that meet these metric goals is conducted in close coordination with state, local, tribal, and other parties in conformance with the Council subbasin, NOAA Fisheries recovery, and other state and local tributary habitat improvement planning processes.

Tributary habitat adaptive management also may need to address any changes in scope to the emphasis or magnitude of tributary habitat metric goals. Results from tributary habitat RM&E activities could provide new information to indicate that an emphasis on tributary habitat projects that address one or more particular limiting factors provides greater benefits to an ESU than projects that address other limiting factors. The Action Agencies would coordinate with NOAA Fisheries to verify that any changes in emphasis and/or magnitude of metric goals would meet the same overall qualitative level of benefit for the respective ESU(s). Timing of these types of adaptive management adjustments will vary according to release of RM&E results. Any changes to implementation of the tributary habitat program likely would be gradual as individual entrainment, flow, channel morphology, and riparian protection and enhancement

[1] The *metric goals* are a performance standard, or target, for specific tributary habitat actions that the Action Agencies committed to implement in the UPA. The tributary habitat actions are consistent with the NOAA Fisheries identified ESU-specific limiting factors and the *metric goals* establish the amount of these actions that the Action Agencies will implement in specific subbasins to benefit specific ESUs. NOAA Fisheries evaluated the metric goals in their jeopardy analysis for the 2004 BiOp.

tributary habitat projects are implemented over a period of months to years; abrupt, within-year changes to the program are unlikely.

Adaptation of the emphasis and magnitude of tributary habitat metric goals also could take place as a result of the overall level of compliance with performance standards as reported in the 3 and 6-year cumulative evaluations discussed below. The emphasis and magnitude of tributary habitat metric goals could either be increased or decreased (in coordination with NOAA Fisheries) to comply with overall hydrosystem performance standard goals.

Hatchery

Hatchery adapative management will be based on findings from hatchery effectiveness RM&E projects; input from NOAA Fisheries, fishery co-managers, and Council; and any relevant ISRP or Independent Scientific Advisory Board (ISAB) recommendations on project implementation.

Hatchery adjustments will be based on input from NOAA Fisheries, including comprehensive marking guidelines, *U.S. v Oregon* proceedings, long-term ESU and population status monitoring, and recommendations from subbasin plans and recovery planning. Recovery plans may recommend long-term changes to the safety-net program that may require associated policy-level decisions for their support.

B. Performance Standards and Progress Reporting

The overarching performance standard for the operation of the FCRPS is the survival of juvenile and adult ESA-listed salmonids through the hydrosystem. This standard is expressed as a numerical percentage. The Action Agencies have largely achieved or exceeded the adult performance standards in the 2000 FCRPS BiOp and will continue to monitor adult passage and periodically assess survival to ensure that adult survival remains high. Juvenile passage survival improvements and implementation of non-hydrosystem actions will be tracked and evaluated relative to the performance targets identified in the BiOp and UPA.

Each non-hydrosystem category of actions in the UPA contains performance measures (generally expressed as a physical or biological parameter that is monitored through time) and targets to ensure accountability for performance and ultimately allow for evaluation of biological performance. The Action Agencies will monitor performance and report the results in annual progress reports and in comprehensive performance evaluations for 2007 and 2010.

Annual Progress Reports

Performance measures and targets will be annually tracked to help determine priorities for management actions and to adaptively manage restoration efforts for affected ESUs. For the term of the UPA and BiOp, the *annual progress reports* will address:

Overall Adult Trends

- Report adult abundance and trends for each listed ESU to determine priorities and timing of future actions to improve juvenile fish survival.

Adult and Juvenile Fish Survival Through the Hydrosystem

- Report on adult and juvenile system survival estimates based on the best available empirical survival data.
- Use survival models to extrapolate empirical survival estimates to obtain system level survival estimates.
- Use surrogates as indicators for ESUs where empirical data is limited or not available.

Predation Rates

- Report on the change in annual predation rates and the estimated resulting change in annual juvenile salmonid survival rates.

Habitat Measures

- Report the numbers of acres protected, restored, or enhanced in the estuary from Action Agency sponsored programs.
- Report the cubic feet per second (cfs) of water leased or purchased and/or conserved, the number of irrigation diversion screen problems resolved, the miles of tributary access or complexity restored, and the miles of riparian habitat protected or enhanced in the Wenatchee, Entiat, and Methow subbasins from Action Agency sponsored programs.
- Report on progress implementing conservation measures and actions.

Hatchery Measures

- Report on the continued operation of the existing safety-net programs included in the UPA.
- Report progress on the construction at Oxbow Hatchery for the expanded production of an additional 150,000 Snake River sockeye salmon smolts to begin in 2008 (if approved through *US v. Oregon*).
- Beginning in 2008, if approved through *US v. Oregon* and adequate broodstock is available, report on the production of an additional 150,000 Snake River sockeye salmon smolts.
- If the management actions are approved through *US v. Oregon*, report on the expansion and operation of the Lower Granite Dam adult fish trap to increase Snake River fall Chinook broodstock collection, support removal of out-of-basin fall Chinook strays, conduct research, and improve accuracy of monitoring of the ESU status.

Comprehensive Programmatic Evaluation

After this 2005 – 2007 implementation period, the Action Agencies will evaluate and report on comprehensive programmatic progress made through 2007 (this report will also serve as the annual progress report for 2007). The ***comprehensive programmatic evaluation report*** will further evaluate the information included in the annual progress reports as described below. This evaluation may be used to inform adaptive management decisions, recognizing that performance standards and measures continue to be refined through the RM&E work groups. In this report the Action Agencies will also evaluate whether non-hydrosystem actions need to be adjusted relative to the status of the hydrosystem performance standard.

Evaluation of Fish Survival through the Hydrosystem

- Identify adult and juvenile system survival rates achieved from 2005 to 2007 using available empirically estimated in-river survival rates for listed ESUs. Use surrogates as indicators for listed ESUs where empirical data is limited or not available.

- Compare updated juvenile survival estimates to the 2004 BiOp performance standard (represented by the mean and range of system juvenile survival estimates) for a subset of comparable water years. Consider new information and if needed re-calculate juvenile fish survival performance standards.
- Determine whether the empirically derived adult survival rates equal or exceed the expected adult survival rates for the applicable subset of water years.
- Based on the comparison of expected and empirically estimated survival rates, determine if adjustments to the long-term hydrosystem priorities are warranted.

Evaluation of Non-Hydrosystem Performance

- Determine whether the Action Agencies have achieved the 3-year performance targets identified in the UPA, *2005-07 IP* and any subsequent updates.
- Considering data from the RM&E action effectiveness program, determine if adjustments to the long-term priorities and targets are warranted.

IV. Actions to be Implemented by Category

This section includes project level detail for specific actions to be implemented by the Action Agencies during the 2005 to 2007 timeframe. The section is organized by category of action (hydrosystem, predator control, habitat, hatchery), applicable strategy/substrategy, and targeted ESU. Near- and long-term targets are identified by strategy or substrategy as appropriate. The targets describe the performance measures to be achieved in the near-term (by 2007) and the long-term (by 2010 or in some cases of hydrosystem configuration improvements, 2014). The project level detail includes steps or actions that the Action Agencies are taking to achieve those targets.

A. Hydrosystem Actions

ESUs benefited: The proposed hydrosystem actions have varying benefits to all or most of the listed ESUs in the Columbia River Basin.

Table 1 summarizes the specific ESUs benefited by groups of hydrosystem actions. These actions are associated with the three hydrosystem strategies.

Table 1 ESUs Benefited by Hydrosystem Actions

	LOWER COLUMBIA CONFIGURATION IMPROVEMENTS	LOWER SNAKE CONFIGURATION IMPROVEMENTS	FLOW OPERATIONS	LOWER COLUMBIA SPILL & PASSAGE	LOWER SNAKE SPILL & PASSAGE	JUVENILE FISH TRANSPORTATION
Upper Columbia Spring Chinook	x		x	x		x
Upper Columbia Steelhead	x		x	x		x
Snake River Spring/Summer Chinook	x	x	x	x	x	x
Snake River Steelhead	x	x	x	x	x	x
Snake River Sockeye	x	x	x	x	x	x
Snake River Fall Chinook	x	x	x	x	x	x

	LOWER COLUMBIA CONFIGURATION IMPROVEMENTS	LOWER SNAKE CONFIGURATION IMPROVEMENTS	FLOW OPERATIONS	LOWER COLUMBIA SPILL & PASSAGE	LOWER SNAKE SPILL & PASSAGE	JUVENILE FISH TRANSPORTATION
Mid-Columbia Steelhead	x		x	x		x
Lower Columbia Chinook	x		x	x		
Lower Columbia Steelhead	x		x	x		
Columbia River Chum	x		x	x		
Upper Willamette Chinook			x			
Upper Willamette Steelhead			x			
Lower Columbia Coho	x		x	x		

Configure Dam Facilities to Improve Juvenile and Adult Fish Passage Survival

Near-term targets (2007): Considerable effort has been undertaken in the last decade to improve and track juvenile and adult passage survival through the hydrosystem. Safe and efficient passage through the hydrosystem is essential to sustaining the long-term viability of the various species and stocks in the Columbia Basin. Information from these programs has been important in providing direction for future improvements in the hydrosystem.

Through 2007 the Corps will focus on actions that were initiated under the 2000 BiOp and are continuing based on the need to improve passage survival rates at mainstem projects. Action plans are underway to guide specific actions at each of the Lower Snake and Columbia River projects and to determine the optimal combination of adult and juvenile passage actions to meet the system performance standards. Alternatives include surface collection techniques (i.e. removable spillway weir (RSW)/corner collector), screened bypass improvements, turbine operation improvements, and sluiceway passage improvements. As each dam is unique and poses different fish passage challenges, each project will be assessed for measures that will improve performance.

Long-term targets (2010): It is anticipated that many of the dam specific configuration actions will be initiated by 2010 and complete by 2014 depending on availability of funds. However, in 2014 some of the final post-construction studies to refine operations of the configuration improvements may still be occurring.

Mainstem Adult and Juvenile Passage Improvements

The Corps will implement the project specific configuration modifications shown in Table 2 to improve adult and juvenile passage survival through the FCRPS hydrosystem. The Corps will continue to coordinate implementation of these projects through the appropriate Regional Forum subteams.

Table 2 Configuration Modifications

Project/Action	Objective/Deliverable	Planning Date[2]
Bonneville Dam		
Bonneville 2nd Powerhouse fish guidance efficiency (FGE) improvements – The Corps will improve passage and survival of spring and summer juvenile fish through Bonneville Dam.	Complete the Action Plan for Bonneville 2nd powerhouse FGE program.	2005
	If warranted, initiate design and construction of juvenile improvements. Anticipate two units will be modified per year.	2006-2008
Bonneville 1st Powerhouse sluiceway improvements – Results from 2004 suggested very high survival through the Bonneville 1st powerhouse sluiceway during spring and summer testing. Additional measures may be needed at the Bonneville first powerhouse to improve collection efficiency and survival at the sluiceway.	Conduct second year of testing.	2005
	Pending results of 2005 testing, initiate designs to improve sluiceway efficiency and survival.	2006
Bonneville 2nd Powerhouse trashrake – This will provide for improved debris cleaning of the fish unit trashracks and improve fish unit reliability.	A new trashrake will be fabricated and delivered to the Bonneville 2nd powerhouse.	2005
Bonneville decision document – This document will assist in determining if additional actions are needed at Bonneville Dam.	Update the Bonneville Project decision document following 2005 project survival tests.	2006
Adult Passive Integrated Transponder (PIT) improvements – This will increase the capability to monitor adult PIT-tag returns and improve ability to evaluate behavior of adults in the ladders. This action is coordinated with the BPA funded project *Installation of Adult PIT-tag Detection Systems* (Project no. 2001-003-00) described in Table 22 Hydrosystem RM&E Studies.	Install additional adult PIT systems in the Washington shore ladder.	2005
	Modify Bradford Island ladder.	2006
	Continue to install or improve PIT systems as needed.	2006-2007
Bonneville 2nd Powerhouse corner collector PIT-tag detection system – This system will allow for improved reach survival estimates for yearling Chinook, steelhead, and fall Chinook.	Install a detection system in the Bonneville 2nd powerhouse corner collector flume.	2006
	Perform post-construction evaluation, and if warranted, install additional antenna array.	2007-2008

[2] Results of on-going research, regional collaboration and prioritization, and future appropriations may affect schedules and actual construction of these features. While the order of construction and final configuration may vary, the Action Agencies plan to complete surface bypass improvements at the eight lower mainstem dams in the next ten years.

Project/Action	Objective/Deliverable	Planning Date[2]
Full flow bypass PIT detection – Full flow bypass PIT detection at Bonneville Dam 2nd powerhouse will assist in reducing fish stress while still providing PIT detection when in full bypass mode. Currently PIT detection requires fish to go through a dewatering facility down to approximately 1 cfs for sampling. The purpose of the project is to provide PIT-tag detection on the full flow 30/36 cfs bypass flume.	Installation – implement full bypass mode when collection and handling at the monitoring facility is not needed.	2006
Sea lion excluder device – The Corps will install a sea lion excluder device at the adult fishway entrances at the Bonneville second powerhouse. Sea Lions are increasing in numbers in recent years at Bonneville Dam with a corresponding increase in take of adult spring Chinook. During the spring of 2005, several California sea lions have been entering the adult fishways at Bonneville Dam. The sea lion excluder device is intended to restrict the sea lions from entering the adult fishways.	Install and evaluate sea lion excluder device at the adult fishway entrances at the Bonneville Dam second powerhouse.	2005
	Install sea lion excluder devices at adult fishway entrances at the spillway and Bonneville first powerhouse if warranted.	2006
The Dalles Dam		
Action Plan framework document – The Corps will prepare an Action Plan for fish passage improvements to increase juvenile survival. Following completion of the document, the alternatives and/or schedule in the configuration actions may be modified.	Complete Action Plan framework document, alternatives being considered in the document include additional spillway improvements, RSW, behavioral guidance system (BGS) to the spillway, BGS to the sluiceway, sluiceway entrance improvements, sluiceway outfall relocation, surface flow bypass at the powerhouse, juvenile bypass system (JBS), turbine improvements, and back-up auxiliary water supply (AWS) systems at the north and east adult fishways.	2005
Sluiceway improvements – Hydroacoustic results from 2004 suggest improved fish survival would occur by opening sluiceway entrances above two turbine units rather than one.	Conduct a second year evaluation to refine sluice gate operation. Because acoustic camera monitoring of the sluiceway entrances showed that many salmonids reject the entrances, design entrance hydraulic improvements (i.e., horned entrance shape).	2005
	Potential prototype testing.	2006
Behavioral Guidance System (BGS) – The BGS will assist in increasing juvenile and adult kelt passage through the spillway by reducing turbine entrainment of salmonids.	Initiate a detailed design for a BGS.	2005
	Design a permanent BGS to the spillway or a prototype design to potentially test.	2006
	A permanent BGS may be installed and tested if a prototype test is not necessary.	2007
Turbine rehabilitation	Scope and complete a study to evaluate a broader range of turbine improvements at The Dalles Dam, including assessment of turbine improvements for higher fish survival.	2005-2008
	Smooth and paint the wetted metal components of the Unit 9 turbine.	2005-2006

Project/Action	Objective/Deliverable	Planning Date[2]
	Evaluate Unit 9 for potential increase in turbine operating efficiency and reduced juvenile injury rate. Field tests will include an evaluation of direct effects of turbine passage on juvenile salmonids, as well as total survival, for fish passing turbines at The Dalles Dam.	2006
East Fishway Auxiliary Water System (AWS)	Prepare plans and specifications for AWS spare parts to increase reliability of adult fish passage facilities, supporting maintenance of current high survival levels.	2006
John Day Dam		
Action Plan framework document – An Action Plan for fish passage improvements to improve juvenile survival. Following completion of the Action Plan framework document, the alternatives and/or schedule for the configuration actions listed below may be modified.	Complete an Action Plan for fish passage improvements. Alternatives include extended-length submersible bar screens, RSWs, skeleton bay surface bypass, BGS, JBS outfall relocation, hydro-combine, turbine improvements, and tailrace egress improvements.	2005
Full flow bypass PIT detection – Full flow bypass PIT detection at John Day Dam will assist in reducing stress while still providing PIT detection when in full bypass mode. Currently fish PIT detection requires fish to go through a dewatering facility down to approximately 1 cfs for sampling. The purpose of the project is to provide PIT-tag detection on the full flow bypass flume.	Implement full bypass mode when collection and handling at the monitoring facility is not needed.	Not currently scheduled. Will be discussed in the Regional Forum.
McNary Dam		
RSW – Proceed with plans for improved juvenile survival through installation of an RSW at this project. Multiple bays may be required. The purpose of the RSWs is to reduce juvenile forebay residence time, improve juvenile guidance and survival, and improve opportunities for increased power generation.	Initiate investigations and pre-design of RSW (assume two RSWs).	2005
	Conduct physical and numeric modeling, pre-engineering work, and environmental reviews.	2006
	Complete modeling and develop detailed specifications.	2007
	Move to construction, again assuming two RSWs.	2008-2010
Extended Submerged Bar Screens (ESBSs) – ESBSs were installed at McNary Dam in the spring of 1996 and 1997. The ESBS installation improves guidance of juvenile salmonids in the bypass facilities.	Design and implement several ESBS improvements. This will improve the reliability of the ESBS systems and improve juvenile survival.	2005
Flow deflectors and divider wall evaluations – A full complement of flow deflectors has recently been installed at McNary Dam. Additional gate hoists and spill operational plans are needed to optimize juvenile survival through the spillway.	Model the best configuration.	2005
	Develop a final plan.	2006
	Design/construct spillway divider wall as warranted.	2007-2008
Forebay temperature improvements – During summer months, water temperature in the McNary forebay, gatewells, and fish collection channel are sometimes deleterious to fish survival and	Evaluate alternatives.	2005
	Develop a preliminary design.	2006
	Develop detailed plans and specifications.	2007

Project/Action	Objective/Deliverable	Planning Date[2]
health. The Corps will examine potential improvements to juvenile survival through methods (both structural and operational) to alleviate or minimize the water temperature gradients, which can develop in the McNary forebay during the summer months.	Proceed with construction.	2008
Juvenile fish facility separator modification – In 2001, a prototype modification to the existing operational separator at McNary Dam was tested. The modification was installed at Lower Monumental juvenile fish facility with good success. The intent of this modification at McNary Dam is to decrease juvenile holding time below the separator and to provide better separation of Chinook and steelhead for transportation. This action will decrease stress on Chinook.	Install a modified separator at McNary Dam juvenile bypass system to decrease holding time at the separator and improve conditions for the transport program.	2006
Spillway gate rehabilitation – Rehabilitate four spillway gates to help meet the voluntary spill criteria for juvenile fish passage.	Complete rehabilitation of four spillway gates.	2005
North shore adult ladder PIT improvements – Installation of PIT-tag antennas in the adult ladder system will provide tracking and research capability of all returning adult salmon. The objective for monitoring the passage of adult salmon migrating upstream provides specific biological information regarding issues such as: (1) survival rates between dams and through the system; (2) partition interdam losses by factor; (3) assessing causal mechanisms associated with losses; (4) assessing reproductive success; and (5) identifying factors affecting passage, survival, and reproductive success. Evaluation of factors effecting upstream migratory efficiency will be utilized to reduce site-specific hindrances.	Prepare plans and specifications.	2005
	Construction.	2006
Ice Harbor Dam		
RSW – RSWs have been identified as having potential to improve fish survival and spill efficiencies at Ice Harbor Dam. The purpose of the RSW is to implement an in-river passage system that improves passage conditions and spill efficiencies, maintains good passage without forebay delay, reduces dissolved gas, and improves opportunities for increased powerhouse generation.	Complete RSW fabrication, transport and installations, and biological testing.	2005
	Continue biological testing, RSW commissioning, and completion contracts.	2006
BGS Option – A BGS will be considered to increase the surface collection efficiency if warranted. A BGS would be a steel curtain across the forebay that creates both a hydraulic and physical plane to guide fish entering the forebay.	Possible design and construction of the BGS if warranted.	2006-2008

Project/Action	Objective/Deliverable	Planning Date[2]
North Shore Fishway AWS – Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids find fish ladder entrances and to proceed up the fishways with minimum delay. The original configuration required that all three of the 250 cfs pumps run at one time to produce enough flow to keep the fishway in criteria. The new AWS system allows for the same criteria to be met utilizing only two of the three pumps. Having one pump spare capacity provides the opportunity for practicing preventive maintenance on idle equipment without requiring system operation outside of the criteria established in the fish passage plan.	Replace bearings for this fishway, improving its ability to maintain adult performance standards.	2005
Juvenile PIT-tag detector on the main fish transportation – This detector will allow estimation of steelhead and yearling Chinook reach survival rates and provide passage data on all PIT-tagged salmon.	Install full flow PIT-tag detector by April on the 36-inch diameter pipe on the main transportation flume to the Ice Harbor juvenile fish facility.	2005
Lower Monumental Dam		
RSW – An Action Plan is being developed for the Lower Monumental RSW to evaluate the juvenile survival improvements. The purpose of the RSW is to implement an in-river passage system that improves passage conditions and spill efficiencies, maintains good passage without forebay delay, reduces dissolved gas, and improves opportunities for increased powerhouse generation.	RSW design development, plans, and specifications.	2005
	RSW construction and biological post construction evaluations.	2007-2008
AWS – Adult fishway auxiliary water supply systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The adult fishway auxiliary water supply system at Lower Monumental Dam has no spare or emergency capacity. An auxiliary water supply will support continued maintenance of adult performance standards.	Develop report for emergency operation and improvements to fishway system.	2005
	Implement upgrades to existing system.	2006
BGS Option – BGS, powerhouse occlusion, and trash debris booms or similar devices may increase juvenile fish guidance, in-river passage and survival at hydropower projects. A BGS is an option to improve survival, depending on the outcome of the RSW evaluations.	If appropriate, initiate BGS design. Planning date is pending RSW biological study results	2008
JBS outfall and divider wall – Evaluate the relocation of the existing JBS outfall and investigate the potential benefits and costs of modifications to the powerhouse/ spillway divider wall. The intent of a divider wall is to improve juvenile egress through the tailrace and improve total dissolved gas (TDG).	Conduct model studies.	2005
	Prepare technical report.	2006
	Design and construct divider wall and relocate outfall if warranted.	2007-2008

Project/Action	Objective/Deliverable	Planning Date[2]
Juvenile fish barge loading improvements – There is a noticeable trend of lower survival for fish transported from this location versus Lower Granite and Little Goose. The scope of this project is to determine the potential causes for lower survival of transported fish at Lower Monumental, develop solutions, and implement the improvements to survival of juvenile fish.	Complete construction.	2005
Spillway parapet walls – Design and construct parapet walls on the north and south side of Lower Monumental spillway to mitigate for wave actions that saturate the north and south tailrace decks caused by new deflector installation on bays 1 and 8.	Construct parapet walls.	2005
Juvenile PIT-tag detector on the main fish transportation flume – The purpose of the project is to provide PIT-tag detection on the full flow 30 cfs bypass flume. This would be done utilizing design elements from the McNary project completed in (fiscal year) FY 2002 and revisions to some of these items planned for Ice Harbor. This project will improve survival and detection of Snake River fish.	Prepare design and specifications.	2006
	Initiate and complete construction.	2007
Little Goose Dam		
RSW – As noted previously, RSWs have potential to improve juvenile fish survival as well as provide opportunities for increased power generation.	Initiate investigations and pre-design of RSW.	2005
	Complete design development, plans, and specifications.	2006
	Complete construction and conduct post-construction biological tests if schedule allows.	2008-2009
	Conduct post-construction evaluation as warranted.	2009/10
AWS – Adult fishway AWS systems provide fish attraction water flows to help migrating adult salmonids to find fish ladder entrances and to proceed up the fishways with minimum delay. The AWS system at Little Goose has no spare or emergency capacity and requires modifications to operate in accordance with the actions set forth in the BiOp and UPA. Plans have been designed and are awaiting the outcome of hydraulic analysis.	Develop report for emergency operation and improvements to fishway system.	2006
	Implement upgrade to existing system.	2007
ESBSs – ESBSs were installed at Little Goose in the spring of 1996. Additional measures are needed to ensure reliability of the ESBS system and provide passage for Snake River fish.	Complete installation of ESBS chains.	2005
Flow deflectors and divider wall evaluations – In order to improve water quality for migrating fish, construct two additional deflectors on Little Goose spillway to reduce TDG during spillway operations.	Conduct preliminary work.	2005-2007
	Construct deflectors.	2008
Full flow juvenile PIT monitoring – The Corps will identify actions to design, fabricate, and install a PIT-tag detector capable of	Prepare design, plans, and specifications; manage project; and award contract.	2006

Project/Action	Objective/Deliverable	Planning Date[2]
performing on a 30/36-inch diameter pipe on the main transportation flume to the Little Goose juvenile fish facility. The purpose of the project is to provide PIT-tag detection on the full flow 30/36 cfs bypass flume.	Complete construction.	2007
Lower Granite Dam		
ESBSs – ESBSs were installed at Lower Granite in the spring of 1996. Additional measures are needed to ensure reliability of the ESBS system.	Complete installation of ESBS chains.	2005
BGS – RSW has been installed and operated at Lower Granite since 2001. Testing is planned in 2005 to determine the effectiveness of the prototype BGS to improve guidance of fish to the RSW.	If warranted, begin design of BGS or an enhancement for surface bypass.	2006
Divider wall evaluations – Divider walls have the potential to improve tailrace egress for juvenile passage and reduce TDG during spillway operations.	Begin evaluation of a divider wall at Lower Granite Dam.	2007
JBS – Develop plans and specifications to modify the existing juvenile fish facilities at Lower Granite Lock and Dam and construction of the modifications.	Develop design documents.	2005
	Develop plans and specifications.	2006
	Initiate construction.	2007-2008
Chief Joseph Dam		
Spillway deflectors – Construction of armoring along the right bank below the dam to prevent erosion associated with increased spill will begin in spring 2005.	Award a contract to construct spillway deflectors.	2005
	Construct spillway deflectors.	2005-2008
	Complete construction and installation of spillway deflectors.	2008
Systemwide configuration improvements		
Stilling Basin Erosion Study– System study with initial efforts focused on Ice Harbor and Lower Snake River to determine effects on stilling basin under spill operations for fish passage. RSW operations would be included to ensure that operations of specialized passage systems do not increase wear or cause other unanticipated affects on gas generation. Provide any structural/mechanical or operational enhancements that may provide a long term operation with reduced negative effects on fish passage, water quality, and dam safety with potential expansion to other sites as warranted. The objective is to determine to the extent possible if there are adjustments to spill patterns/operations that can provide good and safe juvenile passage while allowing good protection of the stilling basin.	Review and research existing data, conduct additional modeling/investigations, and prepare draft report.	2006-2008

Project/Action	Objective/Deliverable	Planning Date[2]
McNary and Snake River Action Plan– Provide optimized configuration recommendation based on a systematic analysis of the survival benefits of various fish passage operations and technology options at the Lower Snake River and McNary dams to meet the requirements of the BiOp; while at the same time balancing fish needs with other needs of the region. The Action Plan will be developed with the flexibility to incorporate changes and ensure regional coordination. This includes the integration of new information derived from research on surface bypass, transportation, spill, turbine survival, and adult salmon passage into a comprehensive plan for implementation of actions specifically directed to achieve the performance goals of survival and population growth for indicator stocks.	Phase one - Preliminary Analysis	2005
	Detailed Analysis	2006-2007

Measures that Address Temperature and Dissolved Gas

The 2004 BiOp includes the Water Quality Plan (WQP) which was a conservation recommendation in the FCRPS 2000 BiOp. The purpose of this plan is to develop a comprehensive strategy of both structural and operational improvements to reduce TDG and temperature for the benefit of anadromous fish species and to further Clean Water Act (CWA) objectives. The specific goals of the plan are to:

- Assist in understanding of systemwide loading capacity and loading allocation by assessing the existing effects at Federal and non-Federal dams and tributaries.
- Provide an organized, coordinated approach to improving water quality, with the goal of moving toward attainment of applicable state and Tribal water quality standards to support the designated uses.
- Provide a framework for identifying, evaluating, and implementing reasonable actions for dam operators to use as they work toward reducing temperature and TDG levels.
- Provide a forum for discussing actions and the feasibility of structural and operational improvements aimed at improving water quality conditions. This information may provide a basis for future beneficial use and water quality criteria revisions.

Over the long term, the WQP anticipates that the Environmental Protection Agency (EPA), NOAA Fisheries, the Action Agencies and the state water quality agencies will integrate WQP implementation into ongoing Total Maximum Daily Load (TMDL) development activities on the mainstem and in the subbasins.

The first version of the WQP was completed in April 2003, and then updated in December 2003 as part of the annual water quality report to the states of Oregon and Washington. The WQP will be updated periodically to reflect progress on structural and operational measures. Currently, the WQP is scheduled to be revised in 2007 to be consistent with the State of Oregon and Washington water quality processes. This plan was developed in coordination with the Water Quality Team of the Regional Forum. Refer to the WQP for specific information and implementation details.

Project Configuration RM&E

The Action Agencies will continue a wide range of hydrosystem studies to evaluate and improve juvenile and adult fish passage survival. The majority of these studies are action effectiveness studies that evaluate specific actions at the hydrosystem projects. The focus of these studies is to provide:

- Information necessary to design, build, modify, and operate fish passage facilities;
- Baseline information on passage efficiencies and survival through projects; and
- Post-construction evaluation of new or modified passage facilities.

For further implementation details, see the Hydrosystem RM&E Section V of this document.

Manage Water to Improve Juvenile and Adult Fish Survival

The Action Agencies' goal for 2005-2007 is to implement water management measures to benefit juvenile and adult survival consistent with other project purposes and available water supply. These measures include system flow objectives for juvenile fish migration, reservoir operations to help meet needs of fish at or near the project, spill for juvenile fish passage, and other aspects of water management.

Each year, the Action Agencies manage a varying amount of natural flow that enters the FCRPS as runoff from precipitation and melting snowpack. This water is managed for multiple purposes, including irrigation, flood control, power production, fish and wildlife, navigation, and recreation. The Action

Agencies will implement the water-management measures for fish survival consistent with the 2004 UPA and the 2000 USFWS BiOp.

Near-term targets (2007): Implement water management measures toward achieving identified juvenile and adult system survival goals.

Long-term targets (2010): As configuration objectives are achieved at Columbia and Snake River dams, the Action Agencies will continue to implement water management measures to achieve identified juvenile and adult system survival goals and optimize the opportunities for increased powerhouse generation that arise concurrently with completed configuration improvements.

Reservoir Operations, System Flow Management, and Spill Operations to Improve Fish Survival

The Action Agencies will prepare an annual Water Management Plan (WMP) as part of the implementation planning process outlined in the 2004 UPA and BiOp and the 2000 USFWS BiOp concerning the operation of FCRPS dams. The WMP will describe the Action Agencies plan to operate the FCRPS dams and reservoirs for the upcoming water year (October 1 through September 30) in a manner consistent with the actions in the 2004 UPA and BiOp and in the 2000 USFWS BiOp while also providing for all congressionally authorized project purposes such as flood control, hydropower, irrigation, navigation, fish and wildlife, and recreation. The Action Agencies will begin with implementation of the project-specific operations described in the UPA, Table 2, pp. 46-47.

The annual WMP will generally be drafted in July and completed by the end of September. The WMP will include general descriptions of FCRPS operations and any special operations (fish passage studies, special tests, navigation, flood control procedures planned for the year, etc.) that are known at the time the plan is developed. The Action Agencies will also develop two detailed updates to describe how the FCRPS projects will be operated for ESA-listed species under actual conditions with current water supply forecasts. The first update will generally be drafted in October and finalized in December to address the fall/winter operation of the FCRPS projects. A spring update will generally be drafted in January and finalized in April to address the spring and summer operation of the FCRPS projects. These updates will take into account changes in the water supply forecast, adjustments from the UPA and other factors at the time of preparation. The WMP and updates will be coordinated through the Technical Management Team (TMT). Review comments from TMT members will be considered in preparing the final WMP and updates. The WMP, updates, and reviewer comments are available on the web at http://www.nwd-wc.usace.army.mil/tmt/documents/wmp/. The TMT is also tasked with making in-season management recommendations for short-term adjustments to hydrosystem operations, as described in the UPA.

Reservoir Operations

- Projects will provide recommended minimum outflows.
- Outflow fluctuations will be limited to avoid stranding fish downstream of the projects.
- Lower Snake River reservoirs are planned to be operated at minimum operating pool (MOP) and John Day reservoir near its minimum irrigation pool to reduce cross-sectional area and increase water velocity. The Snake River Reservoirs may be operated above MOP as necessary to meet authorized project purposes.
- Water releases from storage projects will be regulated to improve water temperatures for fish and the Action Agencies' CWA responsibilities, consistent with authorized project purposes.
- Explore summer reservoir operations at Libby and Hungry Horse, as recommended by the Council, to assess benefits to resident fish needs. Based upon study findings and consistency with the USFWS BiOp, a long-term summer reservoir operation may be developed for these sites.

System Flow Management

- Operate reservoirs to meet reservoir operation objectives outlined in the WMP.
- To the extend possible, operate storage projects to be at their April 10 flood control elevation to provide for flow augmentation for the spring salmonid migration.
- Attempt to refill the storage projects by approximately June 30 to provide summer flow augmentation.
- To the extent possible, provide fall and winter tailwater elevations/flows for chum salmon spawning and incubation.
- Operate Libby to provide for Kootenai River white sturgeon and bull trout.
- Operate Hungry Horse to provide for bull trout.

The Action Agencies expect to annually achieve the following outcomes:

- Available storage will be used to augment juvenile migration flows, although seasonal flow objectives will not be met in all years at all times during migration season.
- Adult and juvenile mainstem passage survival performance standards will be met.
- The Action Agencies will draft Dworshak to 1520 feet in September.

Spill Operations

- Establishment of a long-term operation for the new Ice Harbor RSW.
- Development of a long-term operation (begin and end dates) for the Bonneville second powerhouse corner collector based upon operational tests.
- May explore adjustments to summer spill operations. Factors that will be considered if adjustments are recommended will be (1) determining if the biological objectives of the BiOp can be achieved, and (2) cost efficiences (as recommended by the Council) . Revised project operations may be considered if supported by study results.

Operate and Maintain (O&M) Fish Passage Facilities to Improve Fish Survival

Anadromous fish passage facilities, such as fish ladders and bypasses and/or mitigation hatcheries, were provided at the time many FCRPS projects were built. The original facilities have been updated and new facilities, such as bypass systems, collection and transport facilities, PIT-tag detection systems, and TDG monitoring equipment, have been added at the dams. The Corps District Offices in Seattle, Walla Walla, and Portland coordinate O&M activities at the dams. Each dam has a staff to carry out day-to-day O&M requirements. The Fish Passage Operations and Maintenance Team (FPOM) consisting of federal, state and Tribal representatives, develops operational priorities and operating criteria that are summarized in the Fish Passage Plan (FPP). This plan is updated annually and implemented by project personnel and others involved with river operations. It can be referenced at http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/fpp2002.pdf.

O&M tasks are categorized and implemented as follows: routine, non-routine including capital improvements, juvenile fish transportation, and operations RM&E.

Near-term targets (2007): Implement preventive maintenance programs to ensure the long-term reliability of fish passage facilities.

Long-term targets (2010): Minimize facility outages and ensure long-term reliability of fish passage facilities.

Routine and Non-Routine Maintenance of Fish Passage Facilities

Routine O&M will follow procedures identified in the annual FPP. The plan will be revised annually in coordination with the FPOM committee.

Non-routine O&M activities are one-time activities or are very extensive and so are differentiated from routine O&M. Table 3 lists the non-routine O&M activities that the Corps plans to implement at specific dams for the 2005-2007 timeframe.

Table 3 Non-Routine Fish Passage Facilities O&M

Project/Action	Planning Dates
All dams	
Continue to acquire the necessary spare parts to minimize fish facility outages due to equipment failures.	Ongoing
Review rehabilitation needs of adult fish counting system at each project and develop plans for necessary work.	Ongoing
Report real-time data on turbine and spillway settings on the internet.	Ongoing
Continue to implement and improve avian predation deterrent program at all projects.	Ongoing
Annually monitor for invasive species at all projects.	Ongoing
Continue program to identify and remove obstructions that may injure fish in turbines.	Ongoing
Bonneville Dam	
Implement new fish counting.	2005
Maintenance of new adult PIT system.	2005
Purchase spare parts for adult AWS.	2005-2006
Rehabilitate main turbine units 2, 8, and 10 at the Bonneville 1st Powerhouse main units.	2005-2008
Continue ongoing turbine obstruction removal as units become available.	Ongoing
Develop and improve preventive maintenance on fish facilities.	Ongoing
Dredge Bradford Island adult fish exit.	2007
Dredge forebay if needed.	2007
Refurbish submersible traveling screens (STS) at Bonneville 2nd Powerhouse.	2005-2009
The Dalles Dam	
Implement new fish counting.	2005
Rehabilitate the north shore fishway AWS.	2005
Repair or replace spillway gate cables as necessary.	2005
Remove turbine obstructions.	2005-2007
Purchase spare parts for adult AWS.	2005-2006
Hydraulic evaluation of adult fishway system.	2006
Install Generic Data Acquisition and Control System (GDACS) fishway control system.	2006
Repair adult passage system diffuser gratings on the East ladder .	2007
John Day Dam	
Implement new fish counting.	2005
Upgrade north fishway counting system.	2005-2006
Upgrade to GDACS system.	2005-2006
Maintain fish facilities spare parts.	2005-2006
Overhaul the STS's.	2005-2007
Rehabilitate south fishway turbine.	2005-2007
Modify turbine scroll case/draft tube.	2005-2007
Remove obstructions from turbine environment.	2005-2007
Treat mitigation hatchery wells.	2006-2008
McNary Dam	
Debris handling.	2005-2009
Implement preventive maintenance program.	2005-2009

Project/Action	Planning Dates
Overhaul ESBS.	2005-2009
Replace vertical barrier screen mesh.	2005-2009
Ice Harbor Dam	
Replace adult entrances and hoists.	2008
Rehabilitate diffuser valves and operators.	2005-2006
Rehabilitate south shore fish pumps.	2006-2009
Implement preventive maintenance program.	2005-2009
Debris handling.	2006-2009
Maintain fish facility spare parts.	2006-2007
Purchase STS mesh and chain parts.	2006-2007
Lower Monumental Dam	
Rehabilitate fish counting stations.	2005
Rehabilitate south shore auxiliary water regulating gate.	2005-2006
Implement preventive maintenance program.	2005-2009
Debris handling.	2005-2009
Maintain fish facility spare parts.	2007-2008
Purchase STS mesh and chain parts.	2007-2008
Little Goose Dam	
Implement preventive maintenance program.	2005-2009
Maintain fish facility spare parts.	2007-2008
Debris handling.	2005-2006
Overhaul ESBS.	2005-2007
Rehabilitate fish pumps.	2006-2008
Lower Granite Dam	
Debris handling.	2005-2009
Overhaul ESBS.	2005-2007
Implement preventive maintenance program.	2005-2009
Rehabilitate fish counting stations.	2007-2008
Fish facility spare parts.	2007-2009

Juvenile Fish Transport Actions to Improve Fish Survival

The Corps will continue to collect and transport juvenile salmonids at Lower Granite, Little Goose, Lower Monumental, and McNary Dams per the annual FPP.

When average seasonal flows are expected to equal or exceed 70 kcfs, transportation will begin on April 20, and any fish collected before April 20 will be bypassed back to the river.

When seasonal flows are expected to be less than 70 kcfs, transportation will be maximized when juvenile bypass systems begin operation. Consistent with a requirement of the 2000 BiOp, the Action Agencies will also continue extended summer barging through August 15 to reduce reliance on trucking.

Juvenile Fish Transportation Operations RM&E

The Action Agencies will continue to conduct RM&E to provide information on juvenile fish transportation and delayed mortality. See the Hydrosystem RM&E Actions in Section V of this document for implementation details.

B. Predator Control Actions

ESUs benefited: Avian and piscivorous (fish) predator control actions are targeted to provide survival improvements for all or most listed ESUs. However, the avian predator control actions have little to no effect on Columbia River chum salmon.

Redistribute Avian Predators

Near-term targets (2007): Develop out-of-Columbia River Basin Caspian tern nesting habitat and initiate the phased reduction of the available nesting habitat on East Sand Island. Work will be done in accordance with the forthcoming USFWS' and Corps' RODs for the Final EIS for *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary* and implementation plan being developed for this action.

Long-term targets (2010): Create approximately 8 acres of offsite habitat and reduce suitable nesting habitat remaining on East Sand Island to 1 to 1½ acres for approximately 2,500 – 3,125 pairs of nesting Caspian terns. Conduct further research on double-crested cormorants to determine population status, distribution, diet compositions, and management issues to provide for the development of an EIS for potential management in the lower Columbia River. Finally, if in response to ongoing research (2005 and 2006) NOAA Fisheries and the Action Agencies determine that management of the Caspian tern colony on Crescent Island in the mid-Columbia is warranted, management alternatives will be determined in conjunction with the USFWS.

Redistribute Caspian Terns Nesting on East Sand Island in the Columbia River Estuary to Habitats Located Outside of the Columbia River Basins

In the UPA, the Action Agencies committed to implement the following actions:

- Complete the Final EIS for *Caspian Tern Management to Reduce Predation of Juvenile Salmonids in the Columbia River Estuary* in February 2005 and issue RODs by the relevant agencies in spring 2005.
- Complete an implementation plan for the selected alternative by spring 2005 in coordination with relevant entities.
- Initiate implementation of the selected alternative identified in the Caspian Tern Final EIS in FY 2005 and monitor results.
- Measure the annual Caspian tern predation rates on juvenile salmonids and the resulting juvenile salmonid survival rates.
- Continue the RM&E program to determine the effects of tern redistribution on colony size, annual level of reproductive success, and annual consumption levels of juvenile salmonids by Caspian terns remaining on East Sand Island.
- Monitor other avian predators nesting on East Sand Island and assess consumption of juvenile salmonids if warranted.

The near-term implementation actions to support our UPA commitments are shown in Table 4.

Table 4 Caspian Tern Redistribution Actions

Project Title & Agency	2005-2007 Deliverable/Objective
Caspian Tern Final EIS Implementation Plan (Corps/BPA)	• The USFWS, Corps and BPA will issue decision documents for the Caspian Tern EIS in spring 2005. • The Corps, BPA, and USFWS are currently developing a Caspian tern implementation plan (based on the Caspian Tern Final EIS) to determine agency roles and responsibilities.

Project Title & Agency	2005-2007 Deliverable/Objective
	• A Monitoring and Adaptive Management Plan for the Caspian tern EIS is also being developed by the Corps, BPA, and USFWS to guide future monitoring efforts at East Sand Island and at the offsite habitats.
Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA project no. 1997-024-00), *Lower Columbia River Research* (Corps Order No. W66QKZ50599833), *San Francisco Bay Research* (Corps Order No. W66QKZ50600054)	• Determine the size, habitat use, nesting success, and factors limiting the nesting success of the Caspian tern colony on East Sand Island. • Determine diet composition and consumption of juvenile salmonids by Caspian terns nesting on East Sand Island. • Detect the formation of new Caspian tern colonies at other dredged material disposal sites in the estuary. • Determine the accuracy of tern predation rates on salmonids based on smolt PIT-tag recoveries on colony. • Determine the relative importance of factors that influence the vulnerability of juvenile salmonids to predation by terns in the estuary (e.g., salmonid species, ESU, and stock). • Determine those factors that influence per-capita smolt consumption rates by Caspian terns nesting on East Sand Island to support reliable projections of predation rates on Columbia Basin salmonids. • Determine the colony size, productivity, and diet composition of Caspian terns at several existing colonies in San Francisco Bay.
Avian PIT tag recovery study (Corps Order No. BPS-00-11)	Continue ongoing research to detect PIT tags deposited on avian bird colonies in the estuary.

Analyze the Double–Crested Cormorant Population in the Columbia River, and Evaluate and Implement Alternatives to Manage the Cormorant Population

In the UPA, the Corps and BPA committed to implement the following actions:

- Continue research efforts to better understand cormorant predation on juvenile salmonids initial studies; and,
- Investigate the regional double-crested cormorant population and potential management measures to disperse that population.

The near-term implementation actions to support our commitments are shown in Table 5.

Table 5 Double-Crested Cormorant Actions

Project Title & Agency	2005-2007 deliverable/objective
Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA project no. 1997-024-00), *Develop Double-crested Cormorant Management Alternatives* (Corps Order No. W66QKZ50599833)	• Determine the colony size, habitat use, nesting success and factors limiting nesting success of double-crested cormorants nesting on East Sand Island. • Determine diet composition and consumption of juvenile salmonids by cormorants nesting on East Sand Island. • Survey and monitor the size, nesting success, and the diet composition of colonies of double-crested cormorants at other sites in the estuary and at Foundation Island in the Mid-Columbia. • Determine the accuracy of cormorant predation rates on salmonids based on smolt PIT-tag recoveries on colony. • Determine per capita predation rates on juvenile salmonids by

Project Title & Agency	2005-2007 deliverable/objective
	cormorants nesting at the East Sand Island colony. • Determine those factors that influence per-capita smolt consumption rates by double-crested cormorants nesting on East Sand Island to support reliable projections of predation rates on Columbia Basin salmonids. • Determine the relative importance of factors that influence the vulnerability of juvenile salmonids to predation by cormorants in the estuary (e.g., salmonid species, ESU, and stock).
*Develop Double-crested Cormorant Management Alternatives (*Corps Order No. W66QKZ50599833)	• Determine the geographic boundaries of the Pacific Coast subspecies of double-crested cormorant so that the size of the population and management unit that includes the East Sand Island cormorant colony can be ascertained. • Determine the potential to use social attraction and habitat improvements to attract double-crested cormorants to alternative nesting locations.
Avian PIT tag recovery study (Corps Order No. BPS-00-11)	• Continue ongoing research to detect PIT tags deposited on avian bird colonies in the estuary.

Perform Analysis of the Caspian Tern Population of the Mid-Columbia River, and Evaluate and Implement Alternatives to Manage the Tern Population

In the UPA, the Corps and BPA committed to work with the USFWS to begin the environmental review of potential management alternatives for the Caspian tern colony on Crescent Island population in the mid-Columbia River if NOAA Fisheries and the Action Agencies determine that management of the colony is warranted in response to ongoing research.

The near-term implementation actions to support our commitment are shown in Table 6.

Table 6 Caspian Tern Analysis Actions

Project Title & Agency	2005-2007 Deliverable/Objective
Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA project no. 1997-024-00)	• Determine the size, habitat use, and nesting success of Caspian tern colony on Crescent Island. • Determine diet composition and consumption of juvenile salmonids by Caspian terns nesting on Crescent Island. • Detect any formation of new Caspian tern colonies on other islands in the mid-Columbia River. • Determine the accuracy of tern predation rates on salmonids based on smolt PIT-tag recoveries on colony. • Determine the relative importance of factors that influence the vulnerability of juvenile salmonids to predation by terns at Crescent Island (e.g., salmonid species, ESU, and stock).
Avian PIT tag recovery study (Corps Order No. BPS-00-11)	• Continue ongoing research to detect PIT tags deposited on avian bird colonies in the Mid-Columbia River.

Reduce Fish Predation

Near-term targets (2007): Increase the base reward structure for the sport-reward component of the base NPMP to sustain exploitation rates observed during the program 'heavy-up' in 2004 to increase annual and cumulative juvenile survival rates for most ESUs, especially Snake River fall Chinook. Test the feasibility of increasing tagging and evaluation activities to refine project estimates. If these efforts increase the precision of evaluative measurements, then the Action Agencies will pursue quantitative crediting mechanisms through the adaptive management process outlined in the UPA.

Long-term targets (2010): Reduce the number of larger, predatory fish throughout the mainstem Columbia and Snake rivers and provide systemwide enhancement and benefit to all ESUs.

Expanded Northern Pikeminnow Management Program (NPMP)

In the UPA, BPA committed to:

- Continue the base NPMP and add a general increase in the reward structure in the Sport-Reward fishery similar to that of 2001 and 2004.
- Achieve increased emphasis in the sport reward fishery in Little Goose and Lower Granite reservoirs to benefit listed Snake River Chinook.
- Model estimates of the increased exploitation rate's effect on reduction in predator mortality.
- Increase number of tagged fish to enhance the estimation and evaluation of the NPMP.
- Enhance reservoir specific measures to address "hot spots" of salmonid predation (could include contracting for site-specific removals within project boat restricted zones).

The near-term implementation actions to support our UPA commitment are shown in Table 7.

Table 7 NPMP Actions

Project Title & Agency	2005-2007 Deliverable/Objective
Northern Pikeminnow Management Program (BPA project no. 1990-077-00)	• Maintain 2004 increased reward structure. • Achieve a 15% average exploitation rate by increasing the financial rewards for tagged fish caught in Little Goose and Lower Granite reservoirs. • Continue the existing efforts to model estimates of the effect on juvenile mortality from increased exploitation of northern pikeminnow. • Apply additional resources to enable the tagging of more fish and increase the quality of evaluations. • Conduct site-specific removals using an incentive-based approach.

Other Fish Predators

In the UPA, BPA committed to:

- Add focused pikeminnow removals at Bonneville, The Dalles, and John Day dams/forebay and tailrace boat restricted zones.
- Based upon results of 2004 full evaluation of the NPMP, use the specific removals within project/reservoir boat restricted zones to test removals of other non-indigenous predators – specifically smallmouth bass (*Micropoterus dolomieu)*.
- If tests are successful in 2005, scope possible continuation and/or expansion of test removals into a management action.
- Complete the required environmental documentation associated with potential management alternatives by the end of 2007.
- Develop measurement and crediting mechanisms associated with site-specific removals of non-indigenous predators by 2007.

The near-term implementation actions to support these commitments are shown in Table 8.

Table 8 Other Fish Predation Actions

Project Title & Agency	2005-2007 Deliverable/Objective
Northern Pikeminnow Management Program (BPA project no. 1990-077-00)	• Conduct site-specific removals using an incentive-based approach. • Test the removal of other juvenile fish predators while conducting the site-specific removals. • Work with regional entities to expand efforts to remove other juvenile fish predators if the tests indicate that they could be effectively targeted and removed on a large scale. • Additional activities are already covered under range of alternatives within current environmental assessment (EA)/Finding of No Significant Impact (FONSI) and separate biological opinion for pikeminnow removals. • Develop measurement and crediting mechanisms for site-specific removals of non-indigenous predators through the current infrastructure of the NPMP.

Address Fish Predation by Pinnipeds

In the UPA the Action Agenices included a Predator Control strategy to address fish predation by pinnipeds, but Agencies did not propose specific actions for implementation under this strategy. Studies conducted by the Corps at Bonneville Dam from 2002-2004 estimate that 0.5 to 2% of the population of adult spring chinook salmon are lost due to pinnipends. This information has been reported to the regional agencies and Tribes. Increased predation by pinnipeds has been observed at Bonneville Dam in the spring of 2005, and the Corps has been working closely with NOAA Fisheries and the states to develop a management strategy for the project, including using excluders to keep sea lions out of the fish ladders and various techniques to scare sea lions.

Near-term targets (2007): The Corps and BPA will continue to pursue potential management actions with NOAA Fisheries and the resource agencies. The Corps will also continue to monitor and report sitings of pinnipeds in the Bonneville fishways.

C. Estuary Habitat Protection and Improvement

ESUs benefited: Estuary habitat protection and improvement actions are primarily focused on improving survival of Snake River fall Chinook, but should also benefit all of the Columbia River ESUs as they migrate through the estuary.

The Corps and BPA are accomplishing the estuary habitat actions under existing programs. The Corps authorities for ecosystem restoration generally require a local sponsor, and that sponsor is responsible for acquisition of any property required for the project. For the estuary actions, BPA generally funds the acquisition and also some improvement actions and monitoring through the Council's Fish and Wildlife program. The Corps is generally responsible for planning, engineering, and design and for estuary restoration and creation actions.

Near-term targets (2007):

- Protect, restore, enhance, create, and conserve shallow water and wetland habitats in 5 of the 6 proposed projects.

- Continue feasibility study for the 6th project. Continue to investigate and implement actions based on the estuary action plans.
- Conduct action effectiveness monitoring associated with the estuary projects to improve understanding of the relative value of these habitats to listed ESUs, and compare these values to other geographic areas in the Columbia River Basin.

Long-term targets (2010):

- Complete the 6th proposed project (Chinook) and implement estuary habitat actions that provide the greatest biological benefit to listed ESUs. Additional projects and needs will be identified based on research and regional coordination and developed following the Action Agencies' restoration plan.
- Improve side channel and off-channel habitat in the upper fresh water portion of the estuary, (river mile 46 to river mile 146).
- Document changes to the estuary program through annual progress reports, including status of the actions being taken, the acres of shallow water habitat restored, new information related to the overall effect of the proposed action on shallow water habitat, as well as new information (empirical studies) contributing to an understanding of the value of shallow water habitat as a component of critical habitat. After 3 years of implementing the estuary program, reevaluate the results and revise the actions as appropriate.

Protect Estuary Habitat

The Action Agencies will continue to implement or pursue implementation of the 6 key habitat restoration projects as shown in Table 9.

Table 9 Estuary Habitat Projects

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Crims Island – BPA funded the purchase of 473 acres in 2004 through the Council's Fish and Wildlife program (BPA project no.2003-008-00). This property will continue to be protected from other uses. The Corps initiated habitat improvements in 2004, and baseline and post-construction monitoring will be conducted.	Continue baseline monitoring.
	Continue restoration and creation of 208 acres of intertidal marsh, sub-tidal channels, and riparian forest through excavation and plantings. Complete in 2006.
Sandy River – The Corps and BPA efforts will contribute towards a long-term effort to restore 1,500 acres of the Sandy River Delta in the Columbia River Gorge National Scenic Area. BPA-funded efforts will occur under project no. 1999-025-00.	Continue investigations and design, including determination of whether partial reconnection using culverts or full connection using a bridge is warranted. Complete NEPA in 2005.
	Restore 90 acres of native hardwood riparian forest and 20 acres of a seasonally wet slough. Begin site preparation and exotic species eradication in 2005. Complete planting in 2006.
	Conduct Research to determine benefits to Snake River fall Chinook.
Germany Creek – BPA is funding implementation of this project through project no. 2003-011-00.	Complete appraisal, title, NEPA , Section 7 consultation and acquisition of 155 acres of critical riparian and floodplain habitat along the lower one mile of Germany Creek in 2005.
	Begin restoration, creation, and enhancement actions on approximately 250 feet of an old creek channel to provide chum salmon spawning habitat and approximately 2.5 acres of off-channel rearing habitat for a variety of salmonid populations in the summer of 2005 with completion in the fall of 2005.

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Fort Columbia Wetland – BPA funded efforts will occur under project no. 2003-011-00.	Begin planning and design analysis phase and complete Section 7 consultation and NEPA in 2005.
	Restore approximately 96 acres of tidal wetland habitats in the Chinook River watershed by reestablishing the connection between the distributary of the Chinook River and its associated wetlands and floodplain with the greater Columbia River estuary beginning in 2006 or 2007.
Grays River – 880 acres of habitat lands, including spruce swamp forested wetlands, inter-tidal floodplain channels and emergent scrub-shrub wetlands have been acquired for protection, conservation and restoration. BPA funded efforts will occur under project no. 2003-011-00.	Complete planning and design, NEPA and Section 7 consultation in early 2005.
	Protect and restore over 800 acres of potential salmonid rearing habitat on tidal wetlands and flood plains by acquisition, plantings, and breaching, and removing dikes.
Chinook River – BPA funded efforts will occur under project no. 2003-00-600.	Coordination, planning, engineering and design efforts will continue through the near-term period leading toward restoration and enhancement of approximately 800 acres by 2010.

Estuary RM&E: The Action Agencies' *Plan for Research, Monitoring, and Evaluation of Salmon in the Columbia River Estuary* (Plan) was produced in response to the 2000 FCRPS BiOp. Estuary RM&E actions are discussed in the RM&E Section V of this document.

D. Tributary Habitat Protection and Improvement Actions

Tributary habitat protection and improvement actions were included in the UPA to augment hydrosystem, predator control, and estuary habitat actions for Upper Columbia River spring Chinook and Upper Columbia River steelhead ESUs. Additional conservation measures were included in the UPA to improve survival, but are not required to avoid jeopardy. Conservation measures for Upper Columbia steelhead in the Okanogan subbasin were included by BPA. Conservation measures for Mid-Columbia steelhead in the Upper John Day, Middle Fork John Day, and North Fork John Day; and for Snake River spring/summer Chinook and Snake River steelhead in the Lemhi, Upper Salmon, and Little Salmon subbasins were included by Reclamation.

Table 10, Table 11, and Table 12 identify metrics[3] for known projects and summarize metrics for additional anticipated projects to meet or exceed the near-term (2007) targets. Habitat projects are conducted in cooperation with private landowners and often require additional coordination among a wide array of state, tribal, federal, and local agencies. The list of known projects indicates that construction funding has been secured, and all participants have agreed to complete the project. Preliminary work has been initiated on additional anticipated projects for the ESUs listed below, but specific identification of projects at this time could impair project completion. Consequently, only summary metrics are reported for additional anticipated projects.

[3] Tributary habitat "metrics" represent the ESU-specific performance standards or targets that the Action Agencies agreed to implement in the UPA. The metrics are also sometimes referred to as "milestones".

Upper Columbia River Spring Chinook and Upper Columbia River Steelhead

Streamflow, Entrainment, Channel Morphology, and Riparian Protection and Enhancement Actions

Near-term targets (2007): In the Wenatchee Entiat, and Methow subbasins, lease, purchase, and/or conserve 12 cfs of water; resolve 5 irrigation diversion screen problems; restore 60 miles of tributary access; restore 5 miles of complexity; protect 4 miles of riparian habitat, and enhance 6 miles of riparian habitat through 13 known and 26 additional anticipated projects.

Long-term targets (2010): In the Wenatchee, Entiat, and Methow subbasins, lease, purchase, and/or conserve 40 cfs of water; resolve 10 irrigation diversion screen problems; restore 105 miles of tributary access; restore 10 miles of complexity; protect 12 miles of riparian habitat, and enhance 12 miles of riparian habitat.

Table 10 lists habitat metrics for known projects and estimates for anticipated projects for Upper Columbia ESUs.

Table 10 Habitat Metrics for Upper Columbia River ESUs

Project Name	Agency	CFS to acquire	# of screens	Miles of access	Miles of complexity	Miles protected	Miles enhanced
MVID East Canal Fish Screens	BPA/USBR		1.0				
Hottell Fish Screen	BPA/USBR		1.0				
Marracci Diversion Reconstruction	BPA/USBR			21.8			
Fulton Diversion Structure	BPA/USBR			30.1			
Chewuch Ditch Diversion Structure	BPA/USBR			22.8			
Rockview Channel Reconnect	USBR				0.7		
MSRF Twisp Ponds Reconnection	BPA/USBR				0.8		
McPherson Channel Reconnection	BPA/USBR				1.0		
Whitehall Unscreened Surface Pump Elimination	BPA/USBR		1.0				
Entiat 4 Mile Push-up Dam Replacement and Screen	BPA/USBR		1.0				
Water Entity Project (CBWTP and Riparian Easement)	BPA	5.0				5.0	
Jones Shotwell Ditch	USBR		1.0		0.2		
Peshastin Irrigation District Lower Diversion	USBR			2.4			
Metrics Total for Contracted Projects		**5.0**	**5.0**	**77.1**	**2.7**	**5.0**	**0.0**
Metrics Totals for Anticipated Additional Projects for Completion by 2007		**13.0**	**2.0**	**100.0**	**4.8**	**4.4**	**7.6**
Grand Total		**18.0**	**7.0**	**177.1**	**7.4**	**9.4**	**7.6**
Near-term Metric Goal by 2007		**12.0**	**5.0**	**60.0**	**5.0**	**4.0**	**4.0**
Long-term Metric Goal by 2010		**40.0**	**10.0**	**105.0**	**10.0**	**12.0**	**12.0**

Conservation Measures

Upper Columbia River Steelhead

Streamflow and Riparian Protection and Enhancement (BPA Conservation Measure)

Near-term targets (2007): Enhance riparian habitat and improve flows through instream water transactions in the Okanogan subbasin to improve survival of Upper Columbia River steelhead.

Long-term targets (2010): Improve spawning and rearing habitat for Upper Columbia River steelhead in the Okanogan subbasin.

BPA is considering implementation of proposals from the Colville tribes for work in the Okanogan subbasin to benefit Upper Columbia River steelhead. These proposals include work to improve fish habitat through passage and culvert improvements at Mission Falls and the Omak Creek watershed, and a feasibility study for improving fish passage at McIntyre Dam. BPA will be considering these proposals in coordination with the Council.

BPA will continue to implement the Columbia Basin Water Transactions Program (CBWTP) under the Water Entity Project (project no. 2002-013-01) with the Columbia Cascade ecological province as a focus area. The Washington Water Trust is actively working to develop water acquisitions in the Okanogan as part of the project.

BPA will also implement a riparian easement program in 2005 in conjunction with the National Fish and Wildlife Foundation and various other entities. This initiative is anticipated to provide riparian protection in several subbasins of the Columbia Cascade province, including the Okanogan.

Mid-Columbia River Steelhead

Reclamation will implement conservation measures to improve tributary spawning and rearing habitat for Mid-Columbia steelhead.

Streamflow, Entrainment, and Channel Morphology (Reclamation Conservation Measures)

Near-term targets (2007): In the North Fork, Middle Fork, and Upper John Day subbasins, lease, purchase, and/or conserve 7 cfs of water; and provide technical assistance to resolve 30 irrigation diversion screen problems; restore 24 miles of tributary access; and restore 3 miles of complexity through 12 known and 8 additional anticipated projects.

Long-term targets (2010): No long-term tributary habitat targets were identified in the UPA for this ESU. However, the Action Agencies may add targets using the adaptive management framework if action effectiveness monitoring indicates it would provide needed biological benefits to the ESU.

Table 11 lists habitat metrics for known projects and estimates for anticipated projects for mid-Columbia River ESUs.

Table 11 Habitat Metrics for Mid-Columbia ESUs

Project Name & Number	Agency	CFS to acquire	# of screens	Miles of access	Miles of complexity
Paul's Water Lease	USBR	1.4			
Cummings Creek Flow Restoration	USBR	0.3			
Holliday Ranch McKinney Creek Siphon	USBR	0.3	1.0	3.0	
Holliday Ranch Diversion/Siphon/Screen	USBR	0.5	1.0	4.5	
Patterson Diversion, Beech Creek	USBR			1.7	
Raymond Diversion, Dixie Creek	USBR			3.8	
Lower South Fork John Day Site 4 Diversion	USBR			2.3	
Lower South Fork John Day Site 6 Diversion	USBR			0.8	
Lower South Fork John Day Site 7 Diversion	USBR			0.2	
Lower South Fork John Day Site 2 Cummings Creek	USBR			122.5	
Lower South Fork John Day Site 3 Cummings Creek	USBR			0.3	
Lower South Fork John Day Site 5 Cummings Creek	USBR			0.7	
Metrics Total for Contracted Projects		**2.5**	**2.0**	**139.8**	**0.0**
Metrics Totals for Anticipated Additional Projects for Completion by 2007		**11.3**	**30.0**	**0.0**	**3.0**
Grand Total		**13.8**	**32.0**	**139.8**	**3.0**

Snake River Spring/Summer Chinook and Snake River Steelhead

Reclamation will implement conservation measures to improve spawning and rearing habitat for Snake River spring/summer Chinook and Snake River steelhead.

Streamflow, Entrainment, and Channel Morphology Projects (Reclamation Conservation Measures)

Near-term targets (2007): In the Little Salmon, Lemhi, and Upper Salmon Rivers subbasins, Reclamation will lease, purchase, and/or conserve 20 cfs of water; and will provide technical assistance to resolve 10 irrigation diversion screen problems; restore 54 miles of tributary access; and, restore 0.25 miles of complexity through 7 known and 12 additional anticipated projects.

Long-term targets (2010): No long-term tributary habitat targets were identified in the UPA for this ESU. However, the Action Agencies may add targets using the adaptive management framework if action effectiveness monitoring indicates it would provide needed benefits to the ESU.

Table 12 lists habitat metrics for known projects and estimates for anticipated projects for Snake River ESUs.

Table 12 Habitat Metrics for Snake River ESUs

Project Name & Number	Agency	CFS to acquire	# of screens	Miles of access	Miles of complexity
L-6 Water Lease	USBR	22.0			
L-3A0 Diversion Replacement	USBR			1.0	
L-9 Diversion Replacement	USBR			1.0	
L-44 Diversion Replacement	USBR			0.1	
Gini Canal Siphon	USBR		1.0		
Squaw Creek Screen Improvement	USBR		1.0		
Sink Creek Flow and Screen Improvements	USBR		1.0	1.2	
Metrics Total for Contracted Projects		**22.0**	**3.0**	**3.3**	**0.0**
Metrics Totals for Anticipated Additional Projects for Completion by 2007		**0.5**	**7.0**	**54.0**	**0.3**
Grand Total		**22.5**	**10.0**	**57.3**	**0.3**

E. Hatchery Actions

Implement a Safety-Net Program as an Interim Measure to Avoid Extinction

Snake River Spring/Summer Chinook

Near-term targets (2007): Continue the artificial propagation safety-net programs for the Tucannon River, Grande Ronde River (Upper Grande Ronde, Catherine Creek, and Lostine River populations), and Salmon River (Lemhi River, East Fork Salmon River, and West Fork Yankee Fork populations), and the Johnson Creek summer Chinook supplementation program.

Long-term targets (2010): Continue to fund the Snake River spring/summer Chinook safety-net programs as long as they continue to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions for Snake River spring/summer Chinook safety-net programs are shown in Table 13.

Table 13 Snake River Spring/Summer Chinook Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Tucannon River Spring Chinook – Washington Department of Fish and Wildlife (WDFW) (BPA 2000-019-00)	Continue captive brood program for Tucannon River spring Chinook salmon population.
Grande Ronde Captive Brood O&M – Oregon Department of Fish and Wildlife (ODFW) (BPA 1998-010-01)	Continue captive brood program for Upper Grande Ronde River, Catherine Creek, and Lostine River spring Chinook salmon populations.
Idaho Chinook Salmon Captive Rearing – Idaho Department of Fish and Game (IDFG) (BPA 1997-001-00)	Continue captive rearing program for Lemhi River, East Fork Salmon River, and West Fork Yankee Fork River spring Chinook salmon populations.
Manchester Spring Chinook Captive Broodstock – NOAA Fisheries (BPA 1996-067-00)	Continue Chinook captive propagation in support of project no. 199801001 and project no. 199700100.
Johnson Creek Artificial Propagation – Nez Perce Tribe (BPA 1996-043-00)	Continue supplementation program for Johnson Creek summer Chinook population.

Mid-Columbia River Steelhead

Near-term targets (2007): Reduce the risk of extinction for mid-Columbia River (MCR) steelhead by continuing the MCR steelhead safety-net program associated with the Umatilla Hatchery and the Yakima River steelhead kelt reconditioning program.

Long-term targets (2010): Continue implementing these safety-net programs as long as they continue to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions for MCR steelhead safety-net programs are shown in Table 14.

Table 14 MCR Steelhead Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Umatilla Hatchery O&M – Confederated Tribes of the Umatilla Indian Reservation (CTUIR) [MCR steelhead component] (BPA 1983-435-00)	Continue MCR steelhead safety-net program.
Umatilla Hatchery O&M – ODFW [MCR steelhead component] (BPA 1989-035-00)	Continue MCR steelhead safety-net program.
Yakima River Steelhead Reconditioning Program – Columbia River Inter-Tribal Fish Commission (CRITFC) (BPA 2000-017-00)	Continue MCR steelhead safety-net program.

Lower Columbia River Steelhead

Near-term targets (2007): Reduce the risk of extinction for lower Columbia River (LCR) steelhead by continuing to implement the LCR steelhead safety-net program associated with the Hood River Production Program

Long-term targets (2010): Continue implementing this safety-net program as long as it continues to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions for MCR steelhead safety-net programs are shown in Table 15.

Table 15 LCR Steelhead Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Hood River Production Program – Confederated Tribes of the Warm Springs Indian Reservation (CTWSIR) and ODFW [LCR steelhead component] (BPA 1988-053-07)	Continue LCR steelhead safety-net program.

Columbia River Chum

Near-term targets (2007): Reduce the risk of extinction for Columbia River chum salmon by continuing to implement a program to reintroduce chum salmon into Duncan Creek.

Long-term targets (2010): Continue to implement this safety-net program as long as it continues to be biologically effective and necessary to reduce extinction risk

BPA funded near-term implementation actions for the Columbia River chum safety-net programs are shown in Table 16.

Table 16 Columbia River chum Safety-net Program

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Re-introduction of Columbia River Chum Salmon into Duncan Creek – Pacific States Marine Fisheries Commission (PSMFC) (BPA 2001-053-00)	Continue Columbia River chum salmon safety-net program.

Snake River Sockeye

Near-term targets (2007): Reduce the risk of extinction for Snake River sockeye by continuing to implement the Snake River sockeye salmon safety-net program.

Long-term targets (2010): Continue to implement the Snake River sockeye salmon safety-net program as long as it continues to be biologically effective and necessary to reduce extinction risk.

BPA funded near-term implementation actions to support the Snake River sockeye safety-net programs are shown in Table 17.

Table 17 Snake River sockeye Safety-net Programs

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Redfish Lake Sockeye Salmon Captive Broodstock Program – IDFG (BPA 1991-072-00)	Continue the Snake River sockeye safety-net program.
Redfish Lake Sockeye Salmon Captive Broodstock Rearing and Research – NOAA Fisheries (BPA 1992-040-00)	Continue the Snake River sockeye safety-net program.
Genetic Analysis of Oncorhynchus nerka (modified to include Chinook salmon) – University of Idaho (BPA 1990-093-00)	Continue genetic analysis in support of the Snake River safety-net program.
Sockeye Salmon Habitat and Limnological Research – Shoshone-Bannock Tribes (BPA 1991-071-00)	Continue nursery lake habitat enhancement and limnological monitoring and evaluation in support of the Snake River sockeye safety-net program.

Snake River ESUs

Near-term targets (2007): If needed continue to fund the SNAPP planning process identified in the 2000 BiOp. Step 1 of the SNAPP planning process, identification of any additional Snake River populations requiring a safety-net program to reduce risk of extinction, has been completed. The populations identified by SNAPP as being at severe risk of extinction already have a safety-net program or conservation hatchery program in place to reduce that risk. Therefore, the SNAPP planning process will be suspended. Should the need arise in the future to reinstitute the SNAPP planning process, the BPA would participate as appropriate.

BPA funded near-term implementation actions to support the SNAPP planning process are shown in Table 18.

Long-term targets (2010): Should a future decline in the status of listed ESU populations result in a renewed SNAPP planning process, the BPA will participate in SNAPP to develop contingency safety-net plans for populations at severe risk of extinction. After review and approval by NOAA Fisheries, the Technical Recovery Team (TRT), and other appropriate parties; implementation of any new safety-net programs would be expected to occur through the BPA-funded integrated Fish and Wildlife Program.

Table 18 Actions Supporting the SNAPP Planning Process

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Safety-Net Artificial Propagation Program (SNAPP)	Complete a SNAPP suspension report summarizing

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Coordinator – consultant (BPA 2001-049-00)	work to date and the conclusions of SNAPP Step 1, extinction risk analysis.
Safety-Net Artificial Propagation Program (SNAPP) – multiple contractors (BPA 2002-004-00)	SNAPP planning work will be suspended and ongoing SNAPP contracts will end in 2005.

Reduce Potentially Harmful Effects of Artificial Production and Implement Hatchery Actions to Aid Recovery

Multiple ESUs

Near-term targets (2007): Complete Phase III Hatchery and Genetic Management Plans (HGMP) and submit to NOAA Fisheries for review and approval. BPA will continue to fund project no. 2003-005-00 *Hatchery and Genetic Management Plans* to complete Phase III HGMPs and submit to NOAA Fisheries for review and approval by 2007.

Snake River Spring/Summer Chinook

Near-term targets (2007): Continue funding the planning process for the Northeast Oregon Hatchery (NEOH) production program.

Long-term targets (2010): Potential implementation of NEOH artificial production actions that NOAA determines to be beneficial to recovery of the ESU.

BPA funded near-term artificial production actions to support the Snake River spring/summer Chinook are shown in **Table 19**.

Table 19 Snake River Spring/Summer Chinook Artificial Production Actions

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Northeast Oregon Hatchery Master Plan – Nez Perce Tribe (BPA 1988-053-01)	Continue planning activities for future implementation of NEOH project
Northeast Oregon Hatchery Planning – ODFW (BPA 1988-053-00)	Continue planning activities for future implementation of NEOH project

Snake River Fall Chinook

Near-term targets (2007)

- Fund design and construction of modifications of the Lower Granite Dam adult trap and collection facility to expand fish collection and handling capacity to 6,000 adult fall chinook annually. The expanded facility will be able to provide additional natural-origin fall Chinook broodstock for hatchery operations, increased capability to remove of out-of-basin stray hatchery fall Chinook, and other benefits for the Snake River fall Chinook ESU. .
- Complete construction of trap modifications by the end of 2006, if possible, but no later than 2007.
- BPA and the Corps will fund their appropriate share of the annual operation and maintenance costs for the trapping program in 2005 and 2006, at current trap capacity. As soon as the trapping facility is expanded, possibly in 2006 but no later than 2007, BPA and the Corps will fund their appropriate share of operation and maintenance costs of the expanded facility.
- BPA and the Corps will work with NOAA Fisheries to determine each agency's appropriate share of the annual operation and maintenance costs for the trapping program and will fund their share of operation and maintenance costs in 2005 and 2006, at current trap capacity. As soon as the trapping

facility is expanded, but no later than 2007, BPA and the Corps will fund their share of the operation and maintenance costs of the expanded facility.
- Continue to fund the Snake River fall Chinook component of the Nez Perce Tribal Hatchery program.

Long-term targets (2010)
- Continue to fund operation and maintenance of the expanded adult trap facilities to maintain the biological benefits to the ESU, assuming the hatchery management actions associated with the benefits continue to be supported the *U.S. v. Oregon* parties and NOAA Fisheries.
- Continue to fund the Snake River fall Chinook supplementation program associated with the Nez Perce Tribal Hatchery as long as NOAA Fisheries considers it beneficial to the ESU.

BPA funded near-term Snake River fall Chinook artificial production actions are shown in Table 20.

Table 20 Snake River Fall Chinook Artificial Production Improvements

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Lower Granite Dam Adult Trap Improvements – (Corps and BPA 2005-002-00)	Design and construct improvements to Lower Granite dam adult salmon/steelhead trapping and holding facilities.
Nez Perce Tribal Hatchery O&M [Snake River fall Chinook component] – Nez Perce Tribe (BPA 1983-350-00)	Continue the fall Chinook supplementation program in the upper Clearwater River Subbasin.
Operation of Lower Granite Dam Adult Trap – NOAA Fisheries (BPA 2005-002-00 submitted for new project funding)	In March 2005, NOAA Fisheries, in collaboration with BPA, applied for new project funding through the Council's integrated Fish and Wildlife Program. In July 2005, BPA expects to begin funding NOAA Fisheries, through the new Fish and Wildlife Program project, to operate the adult trap. The Corps will maintain the trap..

Snake River Sockeye

Near-term targets (2007): Take an important step in increasing production to jumpstart the ESU and to support survival and recovery by producing an additional 150,000 smolts annually.

- Improve the facilities at Oxbow Hatchery near Bonneville Dam to produce 150,000 Snake River sockeye salmon smolts annually for release in Idaho in conjunction with the safety-net program, assuming availability of adequate broodstock to provide eggs for smolt production and approval of the new production by *U.S v. Oregon* parties. Complete the Oxbow Hatchery facility improvements in time to allow rearing of brood year 2006 sockeye progeny in a smolt program. Begin transporting smolts to Idaho in 2008.
- Make necessary improvements at existing Snake River sockeye hatchery facilities in Idaho and Washington to support both the new smolt production and the current safety-net program hatchery production.

Long-term targets (2010)
- Work with IDFG, Shoshone-Bannock Tribes, NOAA Fisheries, Council, and other regional entities in planning a long-term sockeye production program in Idaho to support recovery of the ESU.
- Fund O&M costs for the sockeye smolt program as long as NOAA Fisheries considers the program to be beneficial to the ESU.

Table 21 Snake River Sockeye Smolt Production

Project Title & Responsible Agency	2005-2007 Deliverable/Objective
Sockeye Smolt Program – ODFW (BPA 2005-012-00)	BPA is working with NOAA Fisheries, IDFG, and ODFW (the hatchery operator) to develop a project proposal for design, construction, operation, and maintenance of the Oxbow Hatchery smolt facilities. In 2005, BPA will initiate a new project through the integrated Fish and Wildlife Program in coordination with the Council, which will include ISRP review. BPA will work with NOAA Fisheries to secure approval for the project through *U.S. v. Oregon*.

V. Research, Monitoring and Evaluation

As stated in the UPA, the Action Agencies RM&E program is focused on assessing and maximizing performance of the proposed hydrosystem and non-hydrosystem actions to achieve BiOp ESU-specific survival targets. The Action Agencies will continue to participate in the development, coordination, and implementation of a comprehensive RM&E program that is integrated with the Council's Fish and Wildlife Program, the Corps' Anadromous Fisheries Evaluation Program (AFEP), Reclamation's appropriated technical assistance activities, and RM&E activities of other Federal Caucus agencies. The Action Agencies will also continue to coordinate the RM&E program with regional federal, state, and tribal entities and include available results in our annual progress reports.

A. Hydrosystem RM&E Actions

The Action Agencies are implementing projects supporting the three hydrosystem related RM&E strategies. These projects and the associated strategies and objectives are listed in Table 22. These projects address the near- and/or long-term targets listed under the hydrosystem RM&E strategies.

Hydrosystem Corridor Status Monitoring

Near-term targets (2007): Continue to implement adult and juvenile migration status monitoring within the hydrosystem corridor and improve upon these capabilities to provide dam-specific and system-level passage survival information for ESA-listed species.

Long-term targets (2010): Provide the information needed to determine and track the status of ESA populations and their environment (including assessment of performance measures and standards).

Near- and long-term hydrosystem status monitoring activities include:

- Implement and maintain the Columbia River Basin PIT Tag Information System.
- Conduct annual Smolt Monitoring Program (SMP) at seven mainstem Snake and Columbia river dams.
- Monitor wild Snake River spring/summer Chinook salmon smolt migrations.
- Monitor smolt condition relative to biological and environmental conditions.
- Monitor adult returns with the PIT-tag detection system.
- Provide in-season statistical support, real-time run predictions, and annual review of run-timing predictions.
- Monitor emergence, growth, migration timing, and survival of Snake River fall Chinook.
- Obtain accurate counts of Snake River fall Chinook salmon redds upriver of Lower Granite dam.

- Produce digital maps of the riparian areas, wetland features, and stream channel boundaries for mainstem streams.
- Complete downstream migrant kelt assessment to determine magnitude of passage, contribution to population diversity and growth, and potential actions to provide safe passage.

Hydrosystem Action Effectiveness Research

Near- and long-term targets: Advance the understanding of the effectiveness of flow augmentation, spill, transportation, and system configuration changes on fish survival for each ESU.

Ongoing and new AFEP research projects will continue to support the hydrosystem action effectiveness targets.

Near- and long-term hydrosystem related action effectiveness research projects include:

- Study the effect of summer flow augmentation on water temperature, water velocity, and juvenile fall Chinook salmon migratory behavior and survival in Lower Granite Reservoir.
- Determine juvenile fish transportation effectiveness through evaluation of: (1) survival and adult return rates of juvenile salmonids transported compared to in-river migrating fish; (2) post-release losses and barging strategies that minimize post-release mortality; (3) benefits of trucking juvenile salmonids; (4) late-season transportation at McNary Dam; and (5) evaluate D of transported fish relative to in-river migrants.
- A comprehensive evaluation of Snake River fall Chinook transportation is planned to begin when RSWs or other surface-oriented passage is provided at the Snake River collector dams to provide more favorable inriver passage conditions (2007/2008). This study will follow initial determination of related life history attribute considerations influencing transportation success and passage timing through the FCRPS.
- Additional dam specific projects will be implemented to meet near- and long-term targets. This work will continue to be developed and coordinated through the AFEP and in coordination with the SCT.

Hydrosystem Uncertainties Research

Near- and long-term targets (2007 – 2010): The Action Agencies will address the following hydrosystem related uncertainties:

- In-river juvenile migration survival.
- Relative survival difference of in-river vs. transported fish.
- Effect of ocean entry timing.
- Delayed mortality related to hydrosystem passage.
- Different dam passage histories relative to health and delayed mortality.
- Extra mortality and its causes.

Table 22 lists the hydrosystem RM&E projects that the Action Agencies are implementing in the 2005 – 2007 timeframe to address their UPA commitments. The projects are identified as status monitoring (S), action effectiveness (A), and/or uncertainties (U) related.

Table 22 Hydrosystem RM&E Studies – Status Monitoring (S), Action Effectiveness (A), and Uncertainties (U)

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Systemwide studies					
The effects of summer flow augmentation on the migratory behavior and survival of juvenile Snake River fall chinook salmon (BPA 1991-029-00) –Monitor and evaluate post-release attributes and survival of natural and hatchery juvenile fall chinook in the Snake River and Hanford Reach of the Columbia River.	Provide information to fishery managers to maximize the effectiveness of summer flow augmentation.	2005-2006	X	X	
Investigating passage of ESA-listed juvenile fall chinook salmon at Lower Granite Dam during winter when the fish bypass system is inoperable (BPA 2002-032-00) –Describe passage timing, genetic lineage, scale patterns, and locations of fall chinook salmon that hold over in Lower Granite Reservoir during the winter.	The research goal is to provide fishery managers with a complete description of holdover by juvenile Snake River fall chinook salmon, so that the management implications of this atypical migrational behavior can be understood. Refine non-lethal methods for identifying the age at saltwater entry for unmarked Snake River fall chinook salmon adults collected at Lower Granite from 1998 to 2001, and then assess the importance of the holdover strategy to adult returns to the Snake River. Determine if hold over wild fall chinook salmon smolts pass Lower Granite Dam during the winter when the fish bypass systems are shut down.	2005-2006	X		
Analyze the Persistence and Spatial Dynamics of Snake River Chinook Salmon (BPA 1999-020-00) – Results will advance current understanding of the relationship between landscape characteristics and the distribution, pattern, and persistence of chinook salmon. Such information could be key to development of conservation and restoration strategies.	Map the annual distribution of chinook salmon redds in the study area. Map the distribution of potential chinook salmon spawning areas. Describe spawning patch quality. Relate the location, size, and quality of spawning patches to basin geomorphic features. Evaluate the influence of patch size, quality, and context on the distribution of chinook salmon redds.	2005-2007	X		
Estimate production potential of fall chinook salmon in the Hanford Reach of the Columbia River (BPA 1994-069-00) - Define production potential of fall chinook salmon that spawn in the Hanford Reach.	Complete analysis of geomorphic data. Estimate potential redd densities at various seeding levels and compare to known values. Extrapolate range of density values to other areas deemed suitable based on geomorphic features..	2005-2007	X		X
Evaluate Restoration Potential of Snake River Fall Chinook Salmon Spawning Habitat (BPA 2003-038-00) – Evaluate the restoration potential of mainstem habitats for fall chinook salmon, especially spawning habitat in the lower Snake River.	Using the physical characteristics identified at the reference site, quantify the physical characteristics at each of two Snake River study sites: 1) the Ice Harbor tailrace downstream to the Columbia River confluence, and 2) the Lower Granite tailrace from which a spatial data in GIS format and/or spreadsheet/database files; letter report of summary will be produced.	2005-2007	X		
Lower Snake River Transportation Evaluations (Corps) –	Adult returns expected from indexed group of barged fish.	2007	X	X	X

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Tagging for wild steelhead and Chinook for lower Snake River transport evaluations was completed in 2003. An index group comprised only of barged fish was tagged in 2004.	Final reporting	2008	X	X	X
Continued PIT-analysis (Corps) – An historic PIT analysis of transport studies from 1995-2000 will be continued. This research is meant to give insight into how the transportation process could be improved.	Complete an analysis of near shore oceanic and estuarine environmental conditions, the relationship between transport conditions, and hatchery effects. Future updates based on completed adult returns will assist if future actions are warranted.	2005	X	X	X
Mid-Columbia Transport Studies (Corps) – The Corps will release the fourth and final year of Mid-Columbia River fish for a transport evaluation at McNary Dam in 2005. To date, three years of hatchery Chinook and 2 years of hatchery steelhead (third release in 2005) have been released. Research from this study is expected to provide operational information on the success of bypassing and spilling spring migrating fish and whether re-initiating spring transport at McNary Dam would be appropriate.	Final year of released fish.	2005	X	X	X
	Final year of returned fish (Chinook).	2007	X	X	X
	Final year of returned fish (steelhead).	2008	X	X	X
	Final reporting	2009	X	X	X
Snake River Fall Chinook Transport Studies (Corps) – New information suggests that a significant percentage of Snake River fall Chinook adult returns migrated as yearlings. This raises questions about the significance of summer operations to the fall Chinook population. As a result, a more comprehensive plan will be developed in 2005 to address the operational needs of Snake River fall Chinook. Future research would help to determine whether transport or in-river passage in the summer is the best management strategy for juvenile Snake River fall Chinook.	Evaluate the juvenile response and adult smolt-to-adult returns (SARs) under full transportation conditions.	2005-2011	X	X	X
	Develop comprehensive fall Chinook plan for transport vs. in-river survival.	2005	x	x	x
	Implement comprehensive fall Chinook transport vs inriver study, following installation of RSWs and collection of adequate life history information..	2008	x	x	x
	An index group of fish trucked from Lower Granite Dam in September and October has been tagged between 2002-2004. Information gathered is expected to provide information on whether to continue trucking fish from the Lower Snake River in the fall. Adult returns are expected through 2008.	2005-2008	x	x	x
Fish Ladder Temperature Evaluation (Corps) – Study to define any problems that may exist specific to effects of fish ladder water temperature on adult salmon and steelhead and to determine feasible methods of mitigating any adverse affects.	Phase 2 and 3 reporting.	2006		X	
	Optional - test prototype structure	2007-2008		X	
Flood Control Study (Corps) – The System Flood Control	Complete reconnaissance report and project management plan.	2005		X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Review investigation of Columbia River flood control operations is intended to determine what changes, if any would benefit endangered species particularly salmonids, while providing acceptable levels of protection from damaging floods and recognizing project purposes.	Begin feasibility planning phase if funds appropriated. The feasibility planning phase will likely be structured in two stages. The first stage will focus on Columbia Basin hydrologic modeling to verify current information and to assess a set of scenarios evaluating operations to provide flows that could benefit salmonids passage while providing acceptable levels of protection from damaging floods. An interim report will be prepared to summarize and make recommendations on continuing the feasibility planning phase.	2006		X	
	Complete interim report	2007		X	
PIT-tag data recovery (Corps &BPA funding) – The PIT-tag trawler detection system will continue to be operated to collect data in the estuary and estimate system survival to Bonneville Dam tailrace (BPA Project 1993-029-00, cost shared with Corps). The juvenile and adult PIT-tag detection systems will continue to operate and collect passage data at the mainstem dams (BPA Project 1990-080-00). PIT-tag detection will continue on avian islands in the estuary and Crescent Island in the McNary pool to estimate avian predation (Corps funded).	1. Estimate survival for releases of yearling spring/summer chinook salmon and steelhead (hatchery and wild) through the Snake and lower Columbia Rivers. 2. Estimate survival from McNary Dam tailrace to John Day Dam tailrace for subyearling fall chinook salmon during the summer migration. 3. Estimate survival and travel time for subyearling fall chinook salmon from Pittsburg Landing and Billy Creek on the free-flowing Snake River through the lower Snake River. 4. Extend system survival estimates to Bonneville Dam tailrace using PIT tag pair trawl detections. 5. Collection and storage of juvenile and adult passage data at all PIT tag detection sites for other future analyses. 6. Estimate avian predation rates.	2005-2007	X	X	
Avian Predation Deterrent Program (Corps) – Study that will focus on gull and other avian predators at each Lower Snake and Columbia River Dam. The study is being initiated in 2005 to evaluate the affects of various deterrent methods on gulls and other avian predators. The results of this study will provide the basis for future deterrent methods at the projects.	Evaluate various avian deterrent methods.	2005-2006		X	
	Final report and initiate actions based on results	2007		X	
Adult passage studies (Corps) – Complete final summary reports of 1996-2004 radio tagged data (finalized in 2006), including escapement, straying, fallback and passage.	Conduct spawning success evaluations using PIT-tagged fish only. Evaluate new adult PIT detection systems using radio tagged fish (2006, maybe additional year). Develop methodology to measure adult performance standards using PIT data. Investigate development of PIT detection in index tributaries to measure straying	2006-2007		X	
Installation of Adult PIT-tag Detection Systems (BPA 2001-003-00) – Provides for procurement of PIT tag interrogation system	Install additional adult PIT detection systems at Bonneville (Washington Shore).	2005	X	X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
electronic components and labor for assembly and installation in adult fish ladders. This project is coordinated with the Corps' *Adult Passive Integrated Transponder (PIT) improvements* described in Table 2 Configuration Modifications.	Modify adult PIT detection systems at Bonneville (Bradford Island).	2006	X	X	X
	Continue to install PIT detection systems as needed.	2006-2007	X	X	X
Adult Temperature Evaluation (Corps) – Water temperature has the potential to affect the migration behavior of adult salmon (rate of passage, delays, wandering/straying, and survival through the hydrosystem); it also impacts the physiological processes that make spawning successful (egg viability and energy expenditure).	The objective of this study is to determine the effect high water temperatures have on the ability of adult salmonids to migrate to spawning grounds and successfully spawn. Analysis and reporting.	2005 - 2006		X	
Adult Fish Transition Pool and Weir Modifications (Corps) – Radio telemetry studies underway since 1991 have indicated that approximately 70% of the adult salmon migrating upstream turn around near the transition pool in the adult fishways at the Columbia and Snake River Dams. Of the fish that turn around and move down the fishway, approximately 50% fall out of the fishway back into the tailrace. Adults that have fallen out of the fishway may reenter the fishway immediately or may delay several hours in the tailrace. The average cumulative hydrosystem delay due to fallout of the fishway is approximately 3 to 4 additional days to the migration through the hydrosystem. Transition pools (the junction of the base of the ladder, the collection channel, and a fishway entrance) are consistently shown to be an area of delay within the fishway.	Construction if warranted	2005		X	
	Biological test	2006		X	
Kelt Evaluations (Corps) – Studies on steelhead kelts have been conducted for several years. The focus of the studies was to enumerate downstream kelt passage and run timing through the Lower Columbia River projects, and to determine passage routes, distribution, and survival. Recent evaluations have concentrated on determining the return rates of kelts with PIT tags for both in-river and transported groups.	Final summary report from PIT tagged fish.	2005	X		
	Develop action plan, if warranted, to determine if additional measures or studies are needed	2006	X		
Turbine Survival Program (TSP) (Corps) – TSP is focused on measures to improve salmonid survival through turbines which include: a) the development of a long term Biological Index Testing plan, and b) support in completing model and survival studies for the Department of Energy, and c) the development of a process for turbine improvements related to turbine rehabilitation.	Develop scope and costs for a long-term BIT strategy. Continue investigations on the biological assessment of physical model data and bioresponse of fish passing through turbines. Develop detailed John Day BIT strategy. Initiate studies to assess pressure acclimation impacts on fish in the context of past, present, and future TSP studies. Continued participation in regional and national forums as they pertain to fish passage.	2005	X	X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
	Further assess the impacts of pressure acclimation impacts on fish. Continue development of Long-Term Bio Index Test Plan. Correlate the effect of fish diversion devices on fish distribution at the turbine runner. Perform internal turbine prototype imaging and pressure history to better define the physical environment and fish passage route. Implement BIT strategy to additional families of turbines.	2006	X	X	
	Develop plan for modernization of turbine monitoring and control systems to ensure compliance of rigorous biological criteria for operation of turbines. Apply TSP turbine rehabilitation decision framework to existing rehabilitation plan.	2007	X	X	
Evaluate Delayed (Extra) Mortality Associated with Passage of Yearling Chinook Salmon Smolts through Snake River Dams (BPA 2003-041-00)	Continue studies to determine if downstream migration through Snake River dams results in extra or delayed mortality.	2005-2007			X
Delayed Mortality of Juvenile Salmonids (Corps) – Studies to determine the causes and effects of differential delayed mortality of transported juvenile fish ("D").	Evaluate sensory system damage, potential alternative barge release strategies optimizing barging density.	2005-2006	X		X
New Marking and Monitoring Techniques (BPA 1983-319-00) – This project's primary focus is on the development of new and improved PIT-tag technology, including tag, transceiver, and antenna developments.	Continue development of small-stream PIT detection with capability of remote location. Continue development of a high-flow and high-Q PIT detection system for the corner collector at Bonneville. Complete development of a next generation PIT detection transceiver with numerous additional capabilities.	2005	X	X	X
	Complete development of a small-stream PIT detection system with capability of deployment in remote locations. Continue development of various PIT detection systems as needed.	2006	X		
	Continue development of various PIT detection systems as needed.	2007	X		
System and project survival studies – Development of new juvenile tags. The Corps and BPA are evaluating new fish marking techniques that would allow for evaluation of juveniles through the outmigration and as returning adults. This system would allow for juvenile interrogation through all passage routes.,	Initiate evaluation of existing techonologies and regional development of long term goals.	2005		X	
	Initate tag development based on results from 2005 program.	2006-2007		X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Smolt Monitoring by Federal and Non-Federal Agencies (BPA 1987-127-00) – Daily passage data through the mainstem, Snake, Columbia and mid-Columbia Rivers to facilitate fish passage management decisions, including Biological Opinion implementation, is collected daily. Sampling and marking occur at 8 sites of the larger region.	Conduct annual Smolt Monitoring Program at seven mainstem Snake and Columbia River dams, Lewiston Snake River trap, Lower Grande Ronde trap, and White Bird trap on the Salmon River. (Note: Imnaha River trap is another SMP site operated by the Nez Perce Tribe (NPT) under BPA funded project 1997-015-01). Perform PIT tagging of ~25,500 juvenile fish at five hatcheries and upload data files to PSMFC databsase (USFWS tagging support component). Transmit daily juvenile fish passage, sampling, marking, and other biological and hydrological data to online databases at Fish Passage Center (FPC) and PSMFC for distribution region wide. Comply with ESA Section 10 sampling and reporting requirements at all monitoring sites. Participating agencies and organizations prepare and submit annual reports to PSMFC summarizing SMP activities and data collected at each monitoring site for use in compiling FPC annual report.	2005-2007	X		
Statistical Support for Salmonid Survival Studies (BPA 1989-107-00) – Develop better measurement tools and study designs to estimate juvenile and adult salmonid survival. Develop statistical methods to determine survival rates and survival relationships. Provide statistical guidance to Columbia Basin investigators.	Maintain SURPH (Survival Under Proportional Hazards) software and internet access, workstation and PC versions. Alter SURPH as required to work on changing computer platforms. Respond to user questions and provide manuals and instructions. Add improvements to SURPH statistical software. Expand survival links. Add paired release-recapture modeling capabilities. Develop general survival analyses based on user specified models. Provide guidance on adult survival studies to Northwest fisheries community. Develop an adult sample size estimation program. Provide technology transfer through the preparation of technical reports, publications in the professional literature, and statistical consulting to the fisheries community on tagging and fish tracking studies.	2005-2007	X	X	X

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Monitoring Smolt Migrations of Wild Snake River Spring/Summer Salmon (BPA 1991-028-00) – Collect time series information to examine migrational characteristics of wild ESA-listed Snake River spring/summer chinook salmon stocks. PIT tag wild chinook salmon parr annually; and subsequently monitor as parr/smolts at stream traps and river dams.	In spring and early summer 2005, NOAA Fisheries will monitor detections of these wild fish as smolts (from 2003 tagging) at Lower Granite Dam. This real-time detection information will continue to be used by regional fisheries managers (through DART) to make decisions on operation of the FCRPS. NOAA Fisheries will continue to collect and PIT tag wild chinook salmon parr in several Idaho streams. NOAA Fisheries will monitor (collect) six water quality parameters on an hourly basis at five locations in the Salmon River drainage throughout FY2005. Also, PIT-tagged fish from Valley Creek will be monitored by in-stream PIT-tag monitors as they move out of this stream. Survival of parr from tagging to movement out of this stream will be estimated from this data.	2005	X		
Imnaha Smolt Survival and Smolt to Adult Return Rate Quantification (BPA 1997-015-01) – Quantify juvenile emigrant abundance, determine smolt survival from the Imnaha River to Lower Granite and McNary dams, quantify SARs of wild/natural chinook salmon at Lower Granite Dam and back to the Imnaha River	Determine juvenile spring emigration timing of chinook salmon and steelhead smolts from the Imnaha River by operating permanent emigrant Imnaha River trap at river kilometer 7, March 15 to June 5, in cooperation with LSRCP. Determine the emigration timing of previously PIT tagged natural and hatchery chinook salmon and steelhead smolts through interrogations at the lower Imnaha River trap. Provide smolt-monitoring information to the FPC, LSRCP, NEOH M&E and PTAGIS. In cooperation with the LSRCP program, PIT tag over 27,000 smolts to determine the arrival timing, travel time, and survival of natural and hatchery chinook salmon and steelhead released in the Imnaha River subbasin to Lower Granite, Little Goose, Lower Monumental, and McNary Dams.	2005-2007	X		
Numerically simulating the hydrodynamic and water quality environment for migrating salmon in the Lower Snake River (BPA 2002-027-00) –Apply state-of-the-art computer models to describe the complex hydrodynamic and water quality environment in the lower Snake River, and to relate that information to salmon migration.	Continue multi-dimensional modeling research on the 4 lower Snake River reservoirs. Use 3-dimensional computational fluid dynamics model (CFD) to simulate periods with alternative release strategies from upstream reservoirs. Increase understanding of how potential flow augmentation strategies could influence the migration and health of salmonids in the lower Snake River.	2005	X		

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Monitoring and Evaluation Statistical Support (BPA 1991-051-00) –Develop statistical methods for monitoring and evaluating salmonid recovery plans. Provide added-value analyses and statistical support on regional fisheries issues. Provide smolt migration timing predictions on the internet.	Provide in-season statistical support. Provide real-time run-timing predictions. Provide an annual review of run-timing predictions. Provide statistical analysis of historical tagging data. Provide post-season outmigration estimation. Provide analysis of SARs. Provide sample size software. Provide statistical support for region. Provide statistical consultation. Provide continued statistical evaluation of performance standards to improve decision analysis.	2005-2007	X	X	X
Monitoring and Evaluation of Yearling Snake River Fall Chinook Salmon Outplanted Upstream of Lower Granite Dam (BPA 1998-010-04) – Monitor and evaluate survival and performance of yearling fall chinook from Pittsburg Landing, Big Canyon, and Captain John acclimation facilities (BPA Project 1998-010-05) to maximize success of the fall chinook supplementation program above Lower Granite Dam.	Monitor, evaluate, and compare: • Pre-release and release conditions of yearling hatchery fall chinook released at the Pittsburg Landing, Big Canyon Creek, and Captain John Rapids acclimation facilities with on-station releases at Lyons Ferry hatchery; • Post-release behavior, migration timing, and survival of yearling fall chinook released at Pittsburg Landing, Big Canyon Creek, Captain John Rapids, and Lyons Ferry hatchery; • Contribution and distribution of adult returns and smolt-to-adult survivals of yearling fall chinook released from Pittsburg Landing, Captain John Rapids, Big Canyon Creek, and Lyons Ferry hatchery.	2005-2007	X		
Evaluate Factors Limiting Columbia River Gorge Chum Salmon Populations (BPA 2000-012-00) – Evaluate factors limiting chum salmon production in Hardy Creek, Hamilton Springs, and Columbia River side-channel.	Estimate adult and juvenile abundance in Hamilton Springs and Hardy Creek. Describe the biological characteristics of adult and juvenile chum salmon in Hamilton Springs and Hardy Creek. Investigate the movement of adult chum salmon using radio telemetry. Collect information on the habitat characteristics of spawning sites and habitat selection. Operate emergence traps in Hamilton Springs and Hardy Creek. Present work in the annual report.	2005-2007	X		

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Evaluate Spawning Of Fall Chinook And Chum Salmon Just Below The Four Lowermost Columbia River Mainstem Dams (BPA 1999-003-01) – Monitor, protect, and enhance the spawning populations of fall chinook and chum below Bonneville Dam. Search for evidence of fall chinook spawning below The Dalles, John Day, and McNary dams.	Continue to conduct spawning ground surveys for fall chinook and chum in the mainstem Columbia and chum in its tributaries from The Dalles Dam downstream to monitor known spawning areas and identify new locations. Determine on-set, peak, and end of spawning fall chinook and chum in the mainstem Columbia below Bonneville Dam. Continue to refine population estimate methods for fall chinook and chum spawning in the mainstem Columbia below Bonneville Dam and chum in its tributaries from The Dalles Dam downstream. Continue to refine the total Columbia River chum return estimates.	2005-2007	X		
Bonneville Dam					
Project Survival Studies (Corps) – Second year of testing with new Bonneville corner collector and Bonneville sluiceway. Results from the first year of testing suggested very high passage for steelhead, good passage for Chinook, and high survival for all stocks through the corner collector.	Evaluate all juvenile passage routes.	2005	X	X	
	Final report.	2006	X	X	
	Additional evaluation of spillway passage survival may be necessary as well as model studies to establish powerhouse unit operation priorities. Possible other issues identified through the 2005 project-wide evaluation may require investigation.	2006 and 2007	X	X	
Adult Fallback Analysis (Corps) – The Corps will complete the analysis of adult fallback and make recommendations on potential improvements for passage.	Final report**.**	2005		X	
Bonneville 2 FGE Improvements (Corps) – The Corps will evaluate the effect of improvements to the screen bypass system at the Bonneville 2nd powerhouse following installation of the modifications of the screen bypass system if needed.	If warranted, evaluate Bonneville 2nd powerhouse FGE with improvements.	2007-2008		X	
Evaluate the effectiveness of the 1st powerhouse sluiceway (Corps) – Determine the best survival routes and determine if additional measures for juvenile survival improvements are needed at the 1st powerhouse	Data analysis.	2005		X	
	Final report.	2006		X	
The Dalles Dam					
Project Survival Studies (Corps) – Continue evaluation of total project survival and fish passage efficiency (FPE).	Evaluate FPE for all juvenile passage routes.	2005	X	X	
	Final report.	2006	X	X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Spillway Survival Improvements (Corps) – Conduct 2nd year of post-construction evaluation of the spillwall.	Evaluate dam and route-specific survival, tailrace egress, passage distribution, effects on TDG, and erosion monitoring to determine whether additional spillway improvements are warranted. Test the direct effects of implementing a vortex suppression device in Bay 6 on juvenile salmonid injury and survival.	2005		X	
	If warranted, implement permanent vortex suppression devices in spill bays 1 and 6.	2006		X	
	Design and construct additional improvements if warranted.	2006 – 2007		X	
	Final report.	2006		X	
Sluiceway evaluations (Corps)	Conduct a 2nd year evaluation to refine sluice gate operation. This will include a hydroacoustic assessment to determine the improvement of an east and west operation of the sluice gates at The Dalles Dam.	2005		X	
	Summary Report	2006		X	
Evaluate adult delay and fallback (Corps)	Evaluate adult delay and fallback with new spill patterns developed with respect to the installation of the spillway training wall.	2004		X	
	Final report.	2005		X	
Evaluate the effectiveness of the new spill patterns (Corps)	Evaluate the effectiveness of the new spill patterns and spillway training wall and determine whether additional improvements to spillway fish survival are warranted.	2005		X	
	Report.	2006		X	
Evaluate the behavior of fish in the forebay (Corps)	Evaluate the behavior of fish in the forebay of The Dalles Dam to determine the feasibility of a physical guidance device for the forebay and assist in design of a device to improve fish passage efficiency.	2004 – 2005		X	
	Final report	2006		X	
John Day Dam					
John Day Biological Index Testing (Corps) – Survival data from 2002-2003 suggest that turbine survival at John Day is much lower than at other FCRPS projects. In addition, survival data from 2000-2003 showed a clear relationship between tailrace egress and fish survival.	Design a test strategy to evaluate best turbine operating geometry for fish.	2005		X	
	Conduct test strategy.	2006	X	X	
	Evaluate and report on metrics, including direct effects of turbine passage on fish injury and survival, total survival for fish passing all routes (route-specific and dam), and tailrace egress times and routes.	2007	X	X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
McNary Dam					
Survival/Efficiency Study (Corps) –Project passage studies have been conducted from 2002-2004 under current BiOp conditions. Data will be collected to estimate survival of fish in the lower Snake River and make improvements to the project and/or operations to improve fish survival at this Project. Survival information at McNary is needed to make future decisions regarding spill, operations, and project upgrade. Operations of turbines at McNary turbines may change significantly in the future, which makes collection of good data necessary as both a baseline and to estimate fish survival (and fish condition) under test operations. This information is required to assist in decision-making regarding McNary modernization as well as current project operations. This will include meeting objectives for both the Columbia River Fish Mitigation program (CRFM) and the McNary Modernization program.	Fish survival and passage studies using radio telemetry, hydroacousitics, and PIT-tag evaluations. This test may include an evaluation of 24 hour spill vs. 12 hour spill.	2005	X	X	
	Continue survival studies.	2006	X	X	
	Close-out survival studies.	2007	X	X	
Ice Harbor Dam					
Survival/Efficiency Study (Corps) – This will be the first year evaluation of the RSW at Ice Harbor Dam. Early in the spill season a direct survival test will be conducted to ensure the RSW will not impact run of the river fish. This test will be followed by a more comprehensive test to evaluate the passage distribution and project survival under two spill treatments both during the spring and summer conditions.	RSW Evaluation. Estimate all juvenile passage routes for FPE and survival.	2005	X	X	
	Continue survival studies.	2006	X	X	
	Final report.	2007	X	X	
Lower Monumental Dam					
Survival/Efficiency Study (Corps) – Survival studies at Lower Monumental Dam are needed to assist in future decisions for configuration actions and operations at the project. Future decisions at Lower Monumental include RSW installation, relocation of the bypass outfall, and installation of a training wall between the powerhouse and spillway. Studies in 2005 will focus on project distribution and survival through all juvenile passage routes to assist in placement of the RSW and provide baseline conditions.	Passage and survival studies.	2005-2006	X	X	
	Evaluate project distribution and survival through all passage routes including the RSW.	2007-2008	X	X	

Project/Action (Hydrosystem RM&E)	Objective/Deliverable	Date	S	A	U
Little Goose Dam					
Survival/Efficiency Study (Corps) – Fish survival information at Little Goose is extremely limited. The survival level of fish that pass via spillway, turbines, and bypass system is largely unknown. It is imperative to collect this data in order to estimate overall fish survival in the lower Snake River and make informed improvements to the Project and/or operations to improve fish survival at this Project. The immediate focus is to obtain information to assist in placement of the RSW and to determine its potential effectiveness to pass juvenile migrants.	Begin studies. These actions will require significant baseline/survival information to be attained to assist in making decisions about actions at Little Goose.	2005	X	X	
	Survival and passage studies using radio telemetry.	2005	X	X	
	Survival and passage studies of all passage routes including spill. This study may include an evaluation of 12 vs. 24-hour spill.	2006	X	X	
	Complete study efforts.	2007	X	X	
Lower Granite Dam					
Survival/Efficiency Study (Corps) – Evaluate the BGS under two treatments to further determine its affects on fish passage.	The intent of this year's BGS test is to analyze how a modified BGS changes fish behavior. The assessment will help determine the importance of a guidance device in improving passage efficiency to the RSW and increase the understanding of BGS design parameters (spring Chinook and steelhead).	2005 or 2006	X	X	
First year evaluation of subyearling fall Chinook passage through an RSW (Corps) – Little information is available on how subyearlings will use an RSW. This evaluation will provide information on distribution, collection efficiency, and survival of subyearlings through an RSW at Lower Granite Dam. Anticipate one year of study. This study will assist in determining levels of spill needed for the longer-term transport vs. in-river study scheduled in the 2008 timeframe.	Survival and passage studies of RSW/BGS in spring and RSW in summer.	2005	X	X	
	Survival and passage studies if needed in the spring.	2006	X	X	
	Complete study efforts.	2007	X	X	
Flow Deflectors and Divider Wall Evaluations (Corps) – The Corps will evaluate potential modifications to existing deflectors at Lower Granite Dam and investigate potential benefits and costs of installation of a powerhouse/spillway divider wall.	Develop new operational spill pattern.	2007		X	
	Prototype evaluations	2008		X	
	General model evaluations.	2009		X	
	Technical report.	2010-2011		X	

B. Predator Control RM&E Actions

Predator Control Action Effectiveness Research

Near-term (2007) and long-term targets (2010): Estimate the juvenile salmonid survival benefits associated with an increased northern pikeminnow incentive program and the management of Caspian terns. In addition, research efforts will be expanded as necessary to include any predator management programs that are developed for other fish or avian species.

Northern Pikeminnow: BPA will continue to model the additional removal of northern pikeminnow the same way it has evaluated and estimated the cumulative benefits of the NPMP to date. As noted in Section IV.B. of this document, the NPMP (BPA funded project 1990-077-00) will continue to model estimates of the effect on juvenile mortality from increased exploitation of northern pikeminnow.

Caspian tern redistribution: BPA and the Corps will continue to monitor the Caspian tern colony on East Sand Island to determine the response of terns to the management actions and the subsequent changes in predation rates on juvenile salmonids. Tern monitoring will also be conducted at the offsite habitats; this will be done in accordance to the Monitoring and Adaptive Management Plan, which is currently being developed for the Caspian tern management Final EIS. See Section IV.B. of this document for implementation details of the Caspian tern program.

Other fish predation, Mid-Columbia River Caspian tern management, and Double-crested Cormorant management: Action effectiveness monitoring would be a program component of any predator control programs developed and adopted in the future. See Section IV.B. of this document for implementation details for Mid-Columbia River Caspian terns, double-crested cormorants and other fish predators.

Pinniped evaluation: The Corps will conduct evaluations of the effectiveness of harassment effort, acoustic deterrent systems, and sea lion excluder devices to determine their effectiveness. Observations similar to those done for the pinniped predation evaluations from 2002-2004 will be needed in the vicinity of the entrances to measure numbers of animals and predations on salmonids in those areas and in the ladder in 2005 and in subsequent years while effective deterrents for sea lions are developed. Effects on migrating salmonids and lamprey will also be needed to ensure that the excluders are not negatively affecting passage.

Table 23 Predator Control Action Effectiveness Projects

Project/Action & Agency	2005-2007 Deliverable/Objective
Northern Pikeminnow Management Program (BPA 1990-077-00)	Continue and improve ongoing monitoring and evaluation program component of NPMP. Evaluate effectiveness of any other non-indigenous predator management program if tested and implemented.
Avian Predation on Juvenile Salmonids in the Lower Columbia River (BPA 1997-024-00)	Continue the RM&E program to determine the effects of tern redistribution on colony size, annual reproductive success, and annual consumption levels of juvenile salmonids by Caspian terns remaining on East Sand Island. Continue and expand research on double-crested cormorants to determine population status, distribution, productivity, diet composition, and management issues. Continue to investigate the size, nesting success, and consumption of juvenile salmonids by the Caspian tern colony on Crescent Island
Sea lion predation on adult Chinook salmon	Continue evaluation to estimate predation rates of sea lions on adult salmon below Bonneville Dam. The study will also assess

Project/Action & Agency	2005-2007 Deliverable/Objective
	the effectiveness of acoustic deterent methods, hazing in the fishways, and the potential impacts on salmon and sea lions of sea lion excluder devices at Bonneville Dam.

C. Estuary RM&E Actions

Estuary/Plume Status Monitoring

Near-term targets (2007): Provide information needed to determine the status of ESA-listed populations and their environment. Develop estuary habitat pilot status monitoring and participate in regional coordination activities.

Long-term targets (2010): Develop a comprehensive RM&E program for the estuary/ocean that is linked to coordination with other regional agencies' monitoring efforts.

Near- and long-term actions include:

- Monitor presence/absence and population identity of juvenile salmonids in the upper reaches of the estuary.
- Evaluate the role of river flow on habitat opportunities and food web structure for juvenile salmon by comparing historic and current conditions using model simulations and empirically derived food-web linkages.
- Evaluate the role of the Columbia River plume in survival of juvenile salmon through long-term observations, fine-scale process studies, retrospective assessments, and modeling to assess management of flow to improve habitat opportunity.
- Habitat monitoring program to develop protocols, procedures, and indicators for measuring habitat condition for both long term habitat monitoring and restoration project monitoring and evaluation requirements; and a toxic contaminant monitoring project to address accumulation of toxic contaminants in sensitive habitat areas, contaminant trends over time, and possible impacts on sensitive species.
- Estimate survival of juvenile salmonids from Bonneville to the mouth of the Columbia River using acoustic tags.
- Determine the relationships between habitat conditions and the life-history diversity, abundance, and performance of juvenile salmon and the potential salmonid responses to past and future habitat change.
- Evaluate the relationship among time of ocean entry, physical, and biological characteristics of the estuary and plume environment and adult return rates.
- Periodically summarize the information from status monitoring, both estuary-wide and reference site monitoring, and action effectiveness research.
- Evaluate the program evaluation and adjust program objectives and methodologies based on new information.
- Document changes to the estuary program through annual progress reports.
- Develop and monitor performance standards as actions are implemented in the adaptive management process concurrent with identifying which factors may be limiting for salmonid viability.
- Describe the present status of the estuary ecosystem in terms of habitat conditions, habitat connectivity, and fauna relative to pre-European settlement conditions (LCREP Habitat Mapping Project and the Bottom, et al., study).
- Monitor the spatial distribution, life history diversity, and growth of juvenile salmon in the estuary.

- Estimate the survival rates of juvenile salmon of listed ESUs through the tidal-freshwater reach (river miles 46-146), the estuarine reach (river miles 0-46), and the plume (continue survival study initiated in 2001).
- Determine the water quality in estuary salmon spawning and rearing habitat relative to state and federal water quality standards and salmon survival needs (LCREP studies).
- Describe trends in the physical condition of estuary salmon spawning and rearing habitat in terms of substrate type, accretion rates, reduction/oxygenation potential, groundwater level, large woody debris, water velocity, and water surface elevation compared to present conditions (LCREP studies).
- Determine the status and trends of abundance, species composition, and distribution of invasive species in the estuary such as purple loosestrife, shad, and New Zealand mud snails.
- Provide biennial summaries of the status and trends of hydrographic and oceanic conditions affecting salmon survival within the estuary and salmon population size.

Estuary Action Effectiveness Monitoring Research

Near-term (2007) and long-term targets (2010): Evaluate how effectively actions specifically designed to aid listed salmon produce the desired biological and physical response.

- The effects of estuary habitat improvements will be guided by the Action Agencies' *Plan for Research, Monitoring, and Evaluation of Salmon in the Columbia River Estuary.* A new pilot project will be implemented in the lower Columbia below Bonneville dam to test and coordinate effectiveness monitoring activities in the estuary.
- Develop an understanding and quantification of the effect of habitat improvement actions on juvenile salmon in the Columbia River estuary.
- The effects of estuary habitat improvements will be addressed on both a landscape and project scale through implementation of the Thom, et al, study, *Evaluating Cumulative Ecosystem Response to Restoration Projects in the Columbia River Estuary*.
- Determine if individual restoration projects in the Columbia River estuary (no habitat projects in plume), as implemented, meet the project-specific performance goals.
- Determine if the projects collectively meet program goals.
- Determine whether individual restoration projects in the Columbia River estuary are effectively changing relevant structural or functional parameters relative to reference and/or control sites.
- Determine the extent habitat restoration projects in the Columbia River estuary, collectively, are affecting targeted ecosystem processes that support listed salmon. Determine the cumulative effect of habitat restoration on juvenile salmon survival in the Columbia River estuary.

Estuary Uncertainties Research

Near-term targets (2007): Address the relationships of estuary habitat to salmon production and survival and the effects of FCRPS operations on estuary and plume habitat condition.

Long-term targets (2010): Improve analytical capabilities and data sufficient to provide confident assessments of population status and juvenile survival in the estuary/plume environments.

- Determine the significance of the lower river and estuary, including the plume, to listed salmonid ESUs.
- Determine the highest priority habitat types for restoration in the lower Columbia River and estuary.
- Identify changes that could be made to FCRPS operations that would improve habitat conditions in the Columbia River estuary and plume.
- Determine the benefits of tide gate replacement as a means to reconnect habitats to tidal influence, how it pertains to reconnectivity of shallow water habitats, and benefits to ESA listed salmonids.

The Action Agencies will continue to fund the status monitoring (S), action effectiveness (A), and uncertainties (U) related estuary studies listed in Table 24 to address their UPA committments.

Table 24 Estuary Habitat RM&E Projects

Project/Action & Agency (Estuary RM&E)	2005-2007 Objective/Deliverable	S	A	U
McComas et al. 2001-2008, *A study to estimate salmonid survival through the Columbia River estuary using acoustic tag* (Corps).	Develop an acoustic tag and arrays to estimate survival, residence behavior, and ocean entry timing of salmonids. Assess the life histories and FCRPS passage histories and survival. Beginning in 2005 conduct survival studies,to get baseline data on yearling and subyearling chinook travel time and survival from Bonneville dam to the rivers mouth. Out year goals and objectives will be coordinated with the regional fishery managers.	X	X	X
Bottom et al. 2001-2007, *Estuarine habitat and juvenile salmon – current and historic linkages in the lower Columbia River and estuary* (Corps).	Gain information to further our understanding of how juvenile salmonids use the estuarine environment and what factors effect their overall survival and fitness. This information will be critical to assist in present and future estuary restoration activities. As restoration efforts begin in the estuary and lower river, hypotheses will be formalized and specific studies may continue.	X		X
Bottom et al. 2003, *Historic Habitat Food Web Link* (BPA 2003-010-00).	Evaluate the role of river flow on habitat opportunities and food web structures for juvenile salmon by comparing historic and current conditions using model simulations and empirically derived food-web linkages. Continue to provide support to both the conceptual and numeric estuary models that will contribute to understanding the physical processes that control or contribute to potential limiting factors for juvenile salmonids.		X	X
Welch et al. 1998-2003, Canada Department of Fisheries and Ocean, *Ocean survival of juvenile salmonids in the Columbia River plume.* (BPA 2003-114-00).	Develop an ability to allow the assessment of early marine survival and ocean movements for Columbia River salmon stocks. Develop a skeleton acoustic array to demonstrate an approach to tracking movements of individual fish through the river and along the West Coast of North America.	X		X
Thom et al. 2003-2009 *Evaluating the Cumulative Ecosystem response to Restoration Projects in the Columbia River Estuary* (Corps).	Initiate a research project to develop a framework and methodology to measure and evaluate the cumulative effects of habitat restoration actions within the lower Columbia River and estuary. Additionally, develop standard protocols for key monitoring attributes of estuary ecosystem structures, processes, and functions to be implemented at both restoration and reference sites. These protocols have (in draft format) been coordinated throughout the region through LCREP and CREST audiences. The Action Agencies intend to use this multi-year research effort to establish scientific capability to assess whether habitat restoration is having a		X	X

Project/Action & Agency (Estuary RM&E)	2005-2007 Objective/Deliverable	S	A	U
	measurable, cumulative effect on the lower river and estuary, and ultimately contributing to the recovery of ESA listed salmonids in the Columbia Basin.			
Casillas et al. 1998-2003, *Survival and growth of juvenile salmonids in the Columbia River plume*. (BPA 1998-014-00).	Continue to physically characterize and model the Columbia River plume in the nearshore ocean environment, provide estimates of growth of juvenile chinook and coho salmon inside and outside the plume, and document the impact of changing ocean productiity on survival and growth rates of juvenile salmonids.	X		X
LCREP, Lower *Columbia River/Estuary Ecosystem Monitoring*. (BPA 2003-007-00).	Habitat monitoring program to develop protocols, procedures, and indicators for measuring habitat condition for both long term habitat monitoring and restoration project monitoring and evaluation requirements; and a toxic contaminants in sensitive habitat areas, contaminant trends over time, and possible impacts on sensitive species.	X		
Sea Resources Inc., *Effectiveness Monitoring Chinook River Estuary Restoration*. (BPA 2003-006-00).	Monitor and evaluate changes in habitat attributes and juvenile salmonid use before and after the Chinook River estuary restoration project		X	
Estuary RME Pilot Project (BPA 2005-001-00).	Determine presence through time of subyearling Chinook salmon at the Sandy River delta in the tidal freshwater reach of the Columbia River and to integrate these results with data from other selected estuary monitoring studies.	X	X	
Canada-USA Shelf Salmon Survival Study; Canada Department of Fisheries & Oceans (BPA project no. 2003-009-00).	This study will provide a single coast-wide set of data that will allow US and Canadian scientists to begin identifying broad regions of good or poor salmon growth in the ocean, and to begin defining the reasons why growth differs between regions and to establish which specific stocks of salmon remain resident in the areas of poorest growth, and therefore to develop some understanding of why marine survival may differ between different stocks of salmon in the ocean.	X		
Muir et al. 2001-2008, *Evaluation of the relationship among time of ocean entry, physical, and biological characteristics of the estuary and plume* (Corps).	Examine the relationship among time of juvenile salmon ocean entry, physical and biological characteristics of the estuary and near shore ocean plume environmental, and smolt-to-adult return rates for yearling chinook salmon reared by the CEDC fisheries project in the lower Columbia River. This study will assess estuary and near ocean entry timing, and associated physical and biological characteristics, and survival to adult. The present plan is to tag and release salmon for three (possibly four) years with the study continuing through the adult recovery of the last group released. The study is intended to assist the Corps and regional fishery managers with the continuing efforts-to recover ESA listed salmonids.		X	X

Project/Action & Agency (Estuary RM&E)	2005-2007 Objective/Deliverable	S	A	U
Estuary/Ocean RME support and Facilitation; (BPA 2002-077-00).	Provides facilitation, coordination and implementation of RME plan of salmon in the Columbia River estuary.	X	X	X
Bottom et al. 2003, *Lower Columbia River Habitat Mapping* (BPA 2002-012-00).	Describe the present status of the estuary ecosystem in terms of habitat conditions, habitat connectivity, and fauna relative to pre-European settlement conditions.	X		

D. Tributary RM&E Actions

Tributary Status Monitoring

Near-term and long-term targets: Continue to implement tributary habitat pilot status-monitoring projects, participate in regional coordination activities, and implement policies that support a comprehensive and compatible network of regional programs. Assess the limiting factors of the UPA's tributary program subbasins on a periodic basis to ensure that the tributary actions are addressing the correct factors.

In the UPA, the Action Agencies committed to:

- Implement status monitoring pilot projects within the Upper Columbia tributary subbasins to further advance the methods and information needed for assessing the status of fish populations and their environment.
- Monitor John Day subbasin adult steelhead spawning and juvenile migration timing, abundance, and rearing densities.
- Expand the Columbia River Basin PIT-tag information system to systematically plan PIT-tag efforts in the pilot study basins that production and survival can be estimated throughout the system for wild and hatchery fish.

Tributary Habitat Action Effectiveness Research

Near-term targets (2007): Implement action effectiveness research through pilot studies in key subbasins.

Long-term targets (2010): Identify the general magnitude and relative effectiveness of different categories of tributary habitat actions and their combined contribution toward meeting any gap deficiencies. Develop and implement an effectiveness-monitoring program to confirm the benefits of tributary habitat actions.

In the UPA, the Action Agencies committed to:

- Implement a tributary habitat effectiveness project in the Upper Columbia.
- Coordinate tributary action effectiveness efforts with other Federal Caucus agencies, the states and the tribes through the Upper Columbia Basin monitoring strategy and PNAMP.
- Monitor intensively monitored restoration activity watersheds and controls and annually record all metrics. Analyze metrics and report physical and biological responses at 3 and 5 years after the BiOp is signed.
- By the end of year 2 (Dec 2006), all levels of monitoring will be in place (project tracking year 1, reach-scale monitoring, year 2, population productivity effects, year 2)
- In year 3, and each year thereafter, integrate all levels of monitoring to assess if anticipated improvements are being achieved.

Table 25 lists the tributary habitat RM&E projects that the Action Agencies are implementing in the 2005-2007 timeframe to address their UPA commitments. The projects are identified as status monitoring (S), action effectivenss (A), or uncertainties (U) related.

Table 25 Tributary Habitat RM&E Projects

Project/Action & Agency (Tributary RM&E)	2005-2007 Objective/Deliverable	S	A	U
Develop and Implement an Integrated Status and Effectiveness Monitoring Program for Salmonids and their Habitat in Three Pilot Subbasins (BPA 2003-017-00) .	Develop, as subbasin scale pilot programs, status and trend monitoring efforts for anadromous salmonids and their habitat in the pilot subbasins.	X		X
Salmon River habitat enhancement M & E (BPA 1994-050-00)	Maintain habitat improvements and evaluate benefits; monitor salmonid populations and habitat parameters; coordinate land and water stewardship activities; coordinate planning, implementation, monitoring, and evaluation of new improvements and protections.	X		
Salmonid productivity, escapement, trend, and habitat monitoring in the Oregon portion of the Columbia Plateau Province (BPA 1998-016-00) – Monitor natural escapement and productivity of John Day River Basin spring chinook and summer steelhead. Estimate SAR, egg-to-smolt survival, smolt abundance, and adult and parr distribution for chinook and SAR and spawner escapement for steelhead.	Project is implemented in the John Day subbasin, only. Operate smolt migrant traps on the Upper Mainstem and Middle Fork. Estimate smolt production from watersheds where outmigrant traps are operated; PIT-tag and release up to 5,500 steelhead smolts captured in traps and during seining for SAR estimates. Estimate abundance of steelhead redds throughout the John Day subbasin using 50 EMAP-based sampling sites. Measure juvenile steelhead presence and habitat conditions on 50 EMAP-based sites throughout the John Day subbasin. Annual progress report of results, including estimates of John Day steelhead smolt migration timing and survival past Columbia R. dams.	X		
John Day salmonid recovery monitoring program (BPA 2002-033-00) – Update salmonid reproduction goals, compile data to develop predictive models to guide future restoration efforts, compile data that presents historical riparian condition, investigate missing bull trout status information.	Continue the RM&E program being conducted in the John Day subbasin. Assess resource recovery that has resulted from past restoration activities. Evaluate trends in resource recovery resulting from the ongoing watershed program. Identify the current condition and trends in resources as a background to other ongoing evaluations	X	X	
John Day Basin pushup dam research (USBR RME183.JDB.02.100.02)	Investigate the effects of push up dams on anadromous salmonids in the John Day River. Other types of impoundment structures such as lay flat stanchions will be evaluated as alternatives for avoiding the annual costs of bulldozer operations to provide the head necessary for irrigation diversions.	X		
Indexing carrying capacity of salmonids on the basis of stream temperature - John Day Basin (USBR RME183.JDB.03.100.02)	Monitor, analyze, evaluate effects of push up dam removal		X	
John Day Basin Water Management Geographic Information Systems (GIS) Database (USBR RME181.JDB.03.100.04)	Develop geographic information system (GIS) database containing irrigation water strucdtures and appurtenant water rights for ongoing use and maintenance by Oregon Water Resources Dept. (OWRD),		X	

Project/Action & Agency (Tributary RM&E)	2005-2007 Objective/Deliverable	S	A	U
	Reclamation, ODFW, Warm Springs Tribe, Grant County Soil and Water Conservation District, NOAA Fisheries and others.			
Lower Methow tributaries effectiveness monitoring study (USBR RME183.MET.03.100.05a)	Study the geomorphological, hydrologic, and biological responses to irrigation diversion dam redesign and removal in several tributaries in the Methow River Basin.		X	
RME Data Management Plan John Day Basin Pilot: detailed needs assessment for subbasin research and evaluation (USBR RME181.JDB.03.100.06)	Complete the detailed needs assessment and acquire available data and documentation for research monitoring and evaluation on the John Day River Basin.		X	
Methow Basin monitoring coordination Contract (USBR RME183.MET.03.100.07)	Work with subbasin planning team, local, tribal, state, and federal fish experts to develop a fish status and trend and project effectiveness monitoring program for the Methow Basin.		X	
Application of advanced remote sensing in the Columbia River Basin (USBR RME181.CBP.03.100.01)	Track land use and land cover over time.	X		
Database validation for stream restoration projects in the Columbia River Basin (USBR RME183.CBP.04.100.02)	Compile information for the validation of the NOAA Fisheries restoration database. Perform site assessments and collect data at stream restoration projects implemented in the Salmon, Wenatchee, Methow and John Day basins.		X	
John Day Basin Hydrography GIS data editing-BLM (USBR RME181.JDB.04.100.01)	Data themes acquired by Pacific Northwest Region GIS staff include: ODFW 2003 revised Fish Distribution mapping; middle fork & south fork Forward Looking Infrared (FLIR) systems stream water surface temperature data.	X		
Lower Methow tributaries intensive effectiveness monitoring study (USBR RME183.MET.04.200.01a)	Provide technical support from fisheries biologist, and assistance in coordination and review of the proposed study activies. Provide a local contact for landowner coordination through a services contract or other suitable agreement to assist in establishing suitable measurement sites, equipment. Assist in the development of a common database format and data dictionary for the Methow Basin.	X		X
Lower Methow Trib PIT Tag interrogation unit study (USBR RME183.MET.04.200.01b)	NOAA Fisheries design, fabricate, install and maintain a multiple antenna in-stream PIT-tag interrogation system.		X	
Methow River basin hatchery review (USBR RME183.MET.04.200.02)	Review hatchery practices and organize hatchery and habitat managers to develop a coordinated research and monitoring program to assess the possible effects hatchery releases on listed wild salmonids and their habitat for the Methow Basin.		X	
Intensively Monitored Watershed Projects (USBR)	Plan and implement coordinated habitat restoration and effectiveness research projects in key watersheds of the Columbia River basin.		X	
Idaho Natural Production Monitoring and Evaluation (BPA 1991-073-00) – Identifies limiting factors and recommends methods to improve	Manage and collect data for the long-term monitoring database for spring/summer chinook salmon and steelhead trout populations in Idaho.	X	X	

Project/Action & Agency (Tributary RM&E)	2005-2007 Objective/Deliverable	S	A	U
adult-to-smolt and smolt-to-adult survival of chinook salmon and steelhead. Provides long-term monitoring data to determine the effectiveness of recovery actions and population status.				

E. Hatchery RM&E Actions

Hatchery Status Monitoring

Near-term targets (2007): BPA funded the drafting of a comprehensive hatchery-marking plan that could be used to inform NOAA Fisheries marking guidelines. Once NOAA Fisheries provides the marking guidelines, the Action Agencies will then consider how to proceed with marking of hatchery released fish. Any subsequent implementation details would be included in future implementation plans.

Hatchery Action Effectiveness Research

Near-term targets (2007): BPA will continue to fund RM&E to determine whether safety-net hatchery programs and other UPA hatchery actions contribute to recovery of targeted populations of salmon and steelhead. The BPA-funded projects in Table 26 below are those that have a major project component that directly contributes to monitoring and evaluation of the effectiveness of the safety-net programs and other hatchery actions included in the UPA and in this *2005-07 IP*. In some cases, monitoring and evaluation has been incorporated into the safety-net projects previously listed instead of being accomplished through an additional project. There are other RM&E projects that may provide useful hatchery monitoring and evaluation information, e.g., smolt outmigration monitoring data, and/or help resolving scientific uncertainties related to artificial propagation. These projects were not listed in the table.

Long-term targets (2010): Determine whether safety-net hatchery programs contribute to recovery of targeted populations of salmon and steelhead.

Table 26 Hatchery Action Effectiveness Projects

Project/Action & Agency (Hathcery RM&E)	2005-2007 Deliverable/Objective
Umatilla Hatchery M&E – ODFW (BPA 1990-005-00)	Continue monitoring and evaluation related to MCR steelhead safety-net program.
Umatilla Basin Natural Production M&E – CTUIR (BPA 1990-005-01)	Continue monitoring and evaluation related to MCR steelhead safety-net program.
Hood River Production Program M&E – ODFW (BPA 1988-053-04)	Continue monitoring and evaluation related to LCR steelhead safety-net program.
Hood River Production Program M&E – CTWSRO (BPA 1988-053-03)	Continue monitoring and evaluation related to LCR steelhead safety-net program.
Grande Ronde Supplementation Lostine River O&M/M&E – Nez Perce Tribe (BPA 1998-007-02)	Continue monitoring and evaluation related to Grande Ronde Chinook (Snake River Spring/Summer Chinook) safety-net program.
Grande Ronde Supplementation O&M/M&E – CTUIR (BPA 1998-007-03)	Continue monitoring and evaluation related to Grande Ronde Chinook (Snake River Spring/Summer Chinook) safety-net program.
Captive Broodstock Artificial Propagation – Nez Perce Tribe (BPA 1998-010-06)	Continue monitoring and evaluation related to Grande Ronde Chinook (Snake River Spring/Summer Chinook) safety-net program.
Nez Perce Tribal Hatchery M&E – Nez Perce Tribe (BPA 1983-350-03)	Continue monitoring and evaluation related to Snake River fall Chinook supplementation in the Clearwater Basin

F. Harvest RM&E Actions

Near-term (2007) and long-term targets (2010): Implement fish harvesting incidental mortality monitoring focused on Columbia Basin fisheries.

G. *Project Implementation Monitoring*

Near-term targets (2007): Adopt standardized reporting protocols consistent with Pacific Coastal Salmon Recovery Fund (PCSRF) reporting metrics with GIS spatial coordinates for habitat projects. Conduct compliance evaluations of at least 25 percent of habitat improvement projects. Develop and maintain a database system for project tracking and progress reporting.

Long-term targets (2010): Project implementation monitoring is a standard procedure within implementing agencies.

Standardization of reporting metrics is being implemented through ongoing coordination within the PNAMP and through the requirements of Action Agency contracts. Compliance evaluations will be primarily accomplished through the project oversight of contract managers. Additional support may be pursued through contractor support.

H. Data Management System

Near-term targets (2007): Provide data management support for RM&E program information. Implement data management pilot projects in the Upper Columbia (Wenatchee, and possibly the Entiat, and Methow), the John Day subbasin, and a third pilot area within a high priority habitat action area, and the lower Columbia estuary.

Long-term targets (2010): Establish a coordinated information system network to support the RM&E program and related performance assessments.

- Provide data management support for biological and programmatic level performance tracking.
- Develop GIS based data management tools and prototype database system for habitat condition and tributary fish monitoring data.
- Participate and support the Northwest Data Network (NED) project.

Table 27 Data Management Actions

Project/Action & Agency	2005-2007 Deliverable/Objective
Develop and Implement an Integrated Status and Effectiveness Monitoring Program (BPA 2003-017-00)	Develop standardized monitoring protocol tool, spatial (GIS) database, and tabular database (with GIS links). Coordinate across all pilot study areas.
Annual Work Plan – Subcontract for NED Phase II (BPA 1989-062-01)	Coordinate the NED process and achievement of NED products and objectives
Second-Tier Database Support (BPA 1996-019-00)	Hydrosystem survival and fish passage information

I. Regional Coordination

Near-term targets (2007): Integrate the regional, multi-agency network of status monitoring programs with action effectiveness and critical uncertainty research strategies. Coordinate status monitoring and action effectiveness RM&E primarily through the PNAMP.

Long-term targets (2010): Develop an integrative conceptual model to help link the various monitoring and research efforts and further define the regional monitoring network. Develop a robust and comprehensive RM&E program that is linked to and coordinated with other agencies, such as the EPA and state regulatory agencies, as well as NOAA Fisheries. Develop and implement RM&E projects in coordination with other federal, state, and tribal programs.

Coordinate RM&E activities through participation and support of coordinating forums such as the Federal Caucus RM&E work groups, tributary status and action effectiveness pilot project work groups, PNAMP, Upper Columbia Regional Technical Team, and AFEP.

Table 28 Regional Coordination

Project/Action & Agency	2005-2007 Deliverable/Objective
PNAMP Funding (BPA project no. 2004-002-00)	Coordinate PNAMP workgroups and products.
Develop and Implement an Integrated Status and Effectiveness Monitoring Program (BPA project no. 2003-017-00)	Coordinate monitoring approaches and protocols with other regional entities across all pilot study areas.

VI. Other Reclamation Actions

The following actions are associated with the operation of 19 Reclamation projects described in Appendix B of the UPA:

- Continued investigation of the use of the Columbia Basin Project wasteways (primarily Red Rock Coulee and Crab Creek) by listed salmon and steelhead. A final field observation was completed in 2004 and a final report will follow in 2005.
- Continued water quality monitoring of surface return flows, from the Columbia Basin Project. Monitoring will continue through 2006 and a report will be completed in 2007. To the extent the information is available, the report will address potential fish effects. At that time Reclamation and NOAA Fisheries will discuss the need for further action.
- Continued consultation on Reclamation's tributary projects. The ten tributary projects within the range of listed salmon and steelhead include: (1) Yakima, (2) Umatilla, (3) Deschutes, (4) Crooked River (5) Wapinitia, (6) Lewiston Orchards, (7) Tualatin, (8) Okanogan, (9) Chief Joseph (not to be confused with Chief Joseph Dam), and (10) The Dalles (not to be confused with The Dalles Dam).

VII. Additional Actions from the NOAA BiOp

A. Conservation Recommendations

BPA will cooperate with the necessary parties to evaluate the conservation recommendations regarding additional Snake River sockeye and subbasin planning infrastructure, and provide support for any resulting measures recommended through the BPA/Council project review process, subject to available funding within BPA's Integrated Fish and Wildlife Program.

Subbasin Planning Infrastructure

NOAA Fisheries recommended that the Action Agencies continue to facilitate the existing subbasin planning infrastructure "to ensure that subbasin plans are implemented effectively and efficiently and are updated and modified at three-year intervals using the best available scientific information." (see 2004 BiOp p. 9-1). The Council is responsible for directing the subbasin planning process, which is a part of the Council's 2000 Fish and Wildlife Program. BPA provided over $15 million to fund subbasin plan development. The Council has begun to amend subbasin plans into the Fish and Wildlife Program.

Whether the subbasin plan infrastructure is to continue, and whether the plans will be updated and modified at three-year intervals, is part of a broader regional discussion the Council has initiated to address implementation of the subbasin plans. BPA is participating in that discussion and will continue to do so. Subbasin planning infrastructure may also be considered part of the broader effort to address regional recovery planning that is not exclusively related to FCRPS mitigation. As a result, at this point, it is not certain whether or at what level BPA support for this conservation recommendation will be requested, but BPA will continue to cooperate with the Council as it integrates subbasin plans into the Fish and Wildlife Program.

Snake River Sockeye Salmon

NOAA Fisheries recommends that the Action Agencies develop a second artificial propagation facility (in addition to the Oxbow Hatchery smolt program) designed to produce up to 150,000 smolts and suggests that the Action Agencies assess the feasibility of developing the Sawtooth Hatchery as the second facility. At this point, the concept is in an early stage of development by NOAA Fisheries, and is too uncertain for BPA to determine whether it will be able to support such a proposal. The Sawtooth Hatchery is a LSRCP facility operated by IDFG. As a result, this discretionary conservation recommendation should be considered by the Stanley Basin Sockeye Technical Oversight Committee (SBSTOC), a technical forum for implementation of the Snake River sockeye safety-net program, with representation from IDFG, Shoshone-Bannock Tribes, NOAA Fisheries, BPA, and other agencies. Any option for additional smolt production will need the approval of the parties in *U.S. v. Oregon,* and would need to proceed through established fish and wildlife funding processes.

B. Incidental Take

Reasonable and Prudent Measures

The 2004 BiOp requires that the Action Agencies monitor the level of take associated with the UPA and report the results to NOAA Fisheries in a timely manner. It also requires the Action Agencies to minimize the level of take by implementing specific Terms and Conditions. The Action Agencies have included actions to implement these Terms and Conditions in this *2005-07 IP* as follows:

Monitoring Take Due to Mainstem Hydro Operations

Evaluate Reach Survival: See RM&E sections on Hydrosystem Status Monitoring and Hydrosystem Uncertainties.

Monitor Smolt-to-Adult Returns: See RM&E sections on Hydrosystem Status Monitoring and Hydrosystem Uncertainties.

Monitor Delayed Mortality: See RM&E section for Hydrosystem Uncertainties.

Monitor Effects of Dissolved Gas Supersaturation: See RM&E section on Hydrosystem Status Monitoring.

Monitor Adult Survival and Kelt Passage: The Action Agencies continue to count and report adult counts at the Lower Snake and Columbia River projects. In addition, the Action Agencies have funded efforts to determine the survival of adult salmonids with the use of radio tracking techniques. Starting in 2005, with the addition of PIT-tag monitors located in the adult ladder systems, adult survival rates will be calculated. The efforts cited above will allow for annual assessments of adult abundance, adult trends,

and survival through the hydrosystem. Additional information on adult studies can be found in the Hydro Status Monitoring section.

Report Progress in Implementing Fish Passage Plan in a Timely Manner: The FPOM Team develops operational priorities and operating criteria that are summarized in the FPP. This plan is updated annually and implemented by project personnel and others involved with river operations. It can be referenced at http://www.nwd-wc.usace.army.mil/tmt/documents/fpp/fpp2002.pdf. The Corps provides weekly written inspection reports describing out-of-criteria situations, adjustments made to resolve problems, and a detailed account of how out-of-criteria situations affected project fish passage and survival. The weekly inspection reports also include summaries of equipment calibrations, adult fish collection channel velocity monitoring, and water temperature monitoring. The Corps also provides in the annual report, information that summarizes project operations and maintenance, fish passage facility inspections and monitoring, severity of out-of-criteria conditions, and avian predation abatement actions.

Monitoring Take Due to Beneficial Effects of Non-Hydro Actions

Monitoring Impacts of the Fish Predation Reduction Program: The Action Agencies will continue to evaluate and report changes in northern pikeminnow predation rates on juvenile salmonids including impacts associated with continuing the increased incentive program and site-specific fishery implementation. This information will be included in the Action Agency annual reports.

Improving Juvenile and Adult Passage Survival

Additional Measures to Minimize Incidental Take

Refine the SYSTDG gas model and its use as a river operations management tool: The SYSTDG is currently being utilized for management of spill at mainstem FCRPS projects. The model will continue to be refined as new operational information becomes available. For additional information, please refer to the WQP.

Refine a water quality model that addresses Columbia and Snake rivers mainstem temperature monitoring and meteorological data: The Action Agencies are moving forward with refinements to a water quality model. The Water Quality Team (WQT) recommended use of the CE-QUAL-W2 model, which is being refined in phases. The first phase was initiated and anticipated to be complete in 2005. Phase 2 and 3 are scheduled to be completed in the next few years. Each phase is being refined based on a geographical area. Additional information can be found in the WQP.

Evaluate juvenile projects-specific passage survival both before and after configuration and/or operational modifications: The Action Agencies have provided an extensive RM&E program related to dam specific survival studies. (See Section V.A Hydrosystem Action Effectiveness Research.) The intent of these studies is to first develop the baseline information on the potential configuration or operational change and then evaluate the effects of the modification. These studies are part of the Corps' AFEP and are prioritized annually through the Regional Forum process.

Continue to assess and enumerate pre-spawning mortality and reduced spawning success of adult upstream migrating fish: Efforts are continuing to enumerate pre-spawning mortality and spawning success. The ongoing evaluation is being conducted on the South Fork of the Salmon River. The South Fork Salmon River was chosen as a representative site due to its long migration route and well established monitoring system. These studies are identified in Section V.A, Hydrosystem Action Effectiveness Research under the system studies section.

List of Acronyms

AFEP	Anadromous Fisheries Evaluation Program
AWS	Auxiliary Water System
BGS	Behavioral Guidance System
BPA	Bonneville Power Administration
CBWTP	Columbia Basin Water Transaction Program
CE-QUAL-W2	Hydrodynamic and Water Quality Model (2 dimensional)
cfs	Cubic feet per second
CTWSIR	Confederated Tribes of the Warm Springs Indian Reservation
CWA	Clean Water Act
DART	Data Access in Real Time
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Action
ESBS	Extended Submerged Bar Screens
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FLIR	Forward Looking Infrared
FPC	Fish Passage Center
FPE	Fish Passage Efficiency
FPOM	Fish Passage Operations and Maintenance
FPP	Fish Passage Plan
GDACS	Generic Data Acquisition Control System
GIS	Geographical Information System
HGMP	Hatchery Genetic Management Plan
IDFG	Idaho Fish and Game
ISAB	Independent Scientific Advisory Board
ISRP	Independent Scientific Review Panel
IT	Implementation Team (of the NOAA Fisheries Regional Forum)
ITS	Incidental Take Statement
JBS	Juvenile Bypass System
LCR	Lower Columbia River
LCREP	Lower Columbia River Estuary Partnership
LSRCP	Lower Snake River Compensation Plan
MCR	Mid-Columbia River
MOP	Minimum Operating Pool
NED	Northwest Environmental Database
NEOH	Northeast Oregon Hatchery
NOAA	National Oceanic and Atmospheric Administration
NPMP	Northern Pikeminnow Management Program
NPT	Nez Perce Tribe
O&M	Operations and maintenance
ODFW	Oregon Department of Fish and Wildlife
OWRD	Oregon Water Resources Department
PC	Personal Computer
PCSRF	Pacific Coast Salmon Recovery Fund
PIT	Passive Integrated Transponder
PNAMP	Pacific Northwest Aquatic Monitoring Program
PSMFC	Pacific States Marine Fisheries Commission
PTAGIS	PIT Tag Geographical Information System
RM&E	Research, Monitoring and Evaluation
ROD	Record of Decision

RPA	Reasonable and Prudent Alternative
RSW	Removable Spillway Weir
SAR	Smolt-to-Adult Return
SBSTOC	Stanley Basin Sockeye Technical Oversight Committee
SMP	Smolt Monitoring Program
SNAPP	Safety-net Artificial Propagation Program
STS	Submersible Traveling Screens
SURPH	Survival Under Proportional Hazards
SYSTDG	System Total Dissolved Gas
TDG	Total Dissolved Gas
TMDL	Total Maximum Daily Load
TMT	Technical Management Team (of the NOAA Fisheries Regional Forum)
TOC	Technical Oversight Committee
TRT	Technical Recovery Team
TSP	Turbine Survival Program
UPA	Updated Proposed Action
USFWS	U. S. Fish and Wildlife Service
WMP	Water Management Plan
WQP	Water Quality Plan